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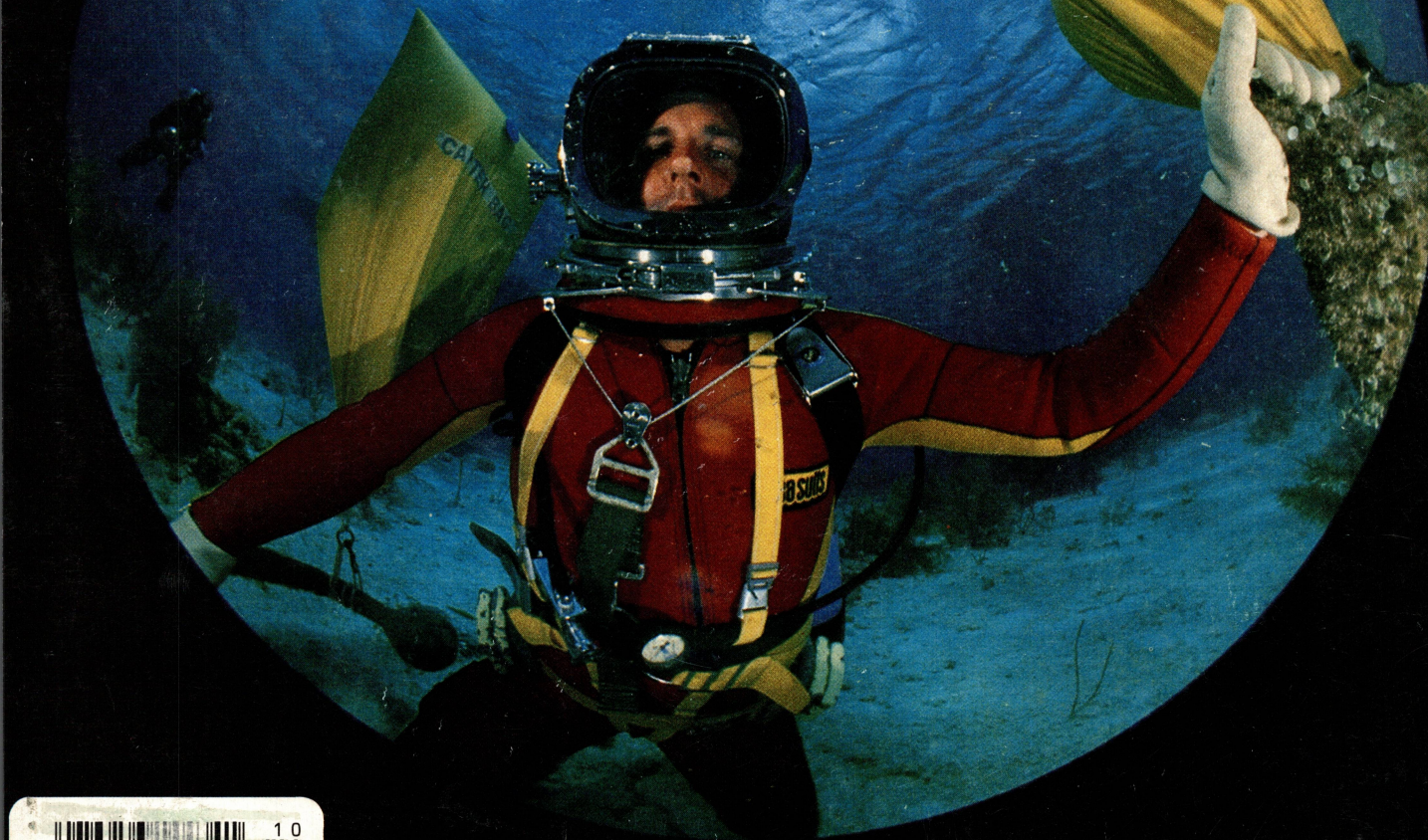
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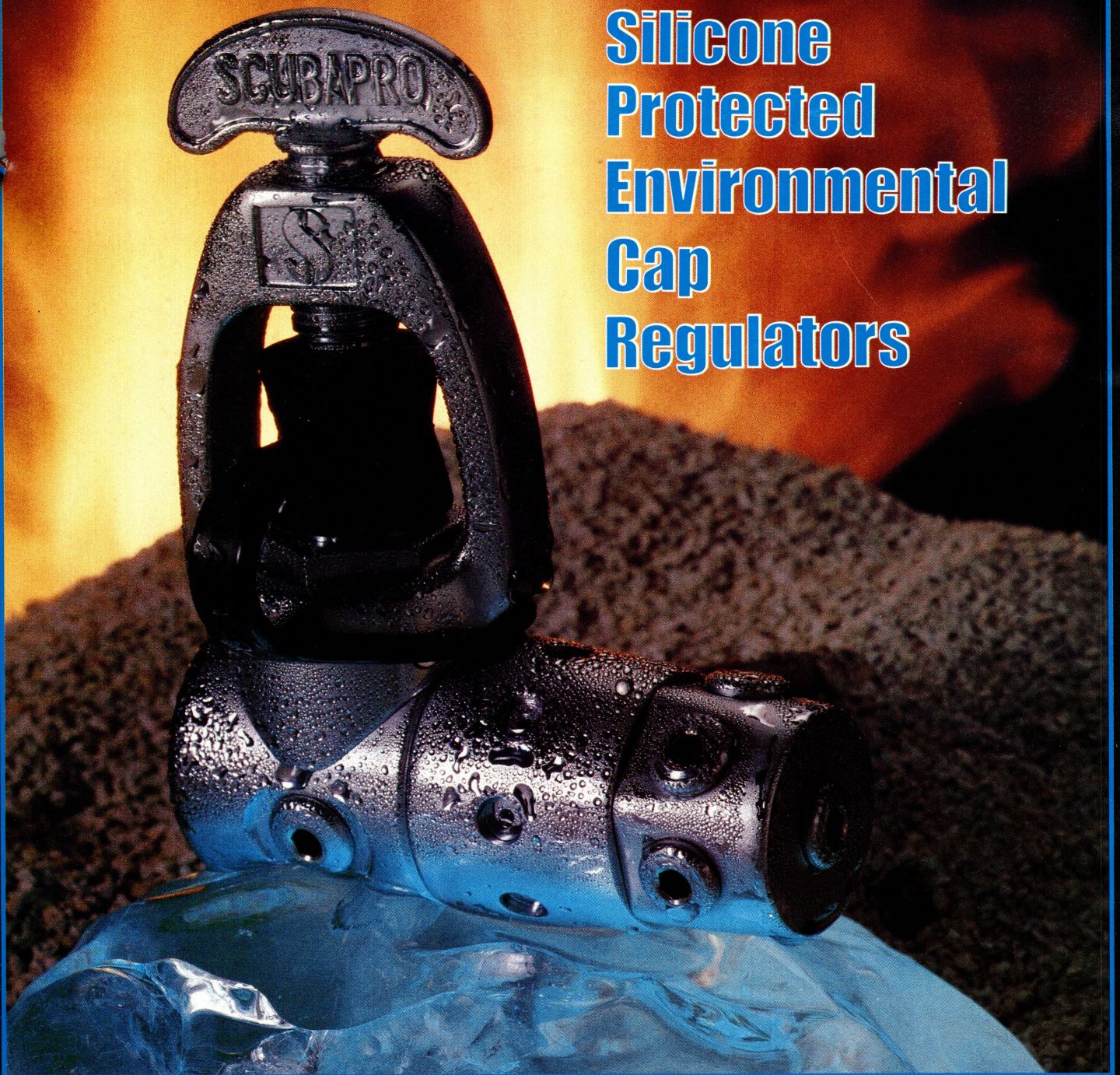
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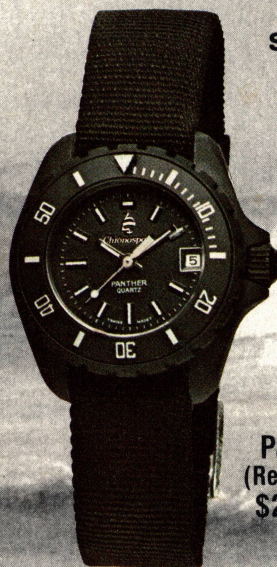
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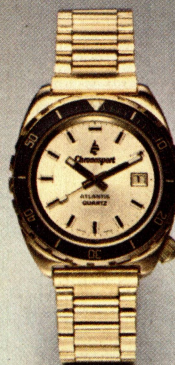
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skindiver

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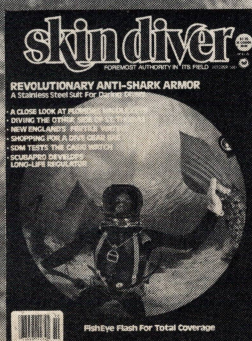
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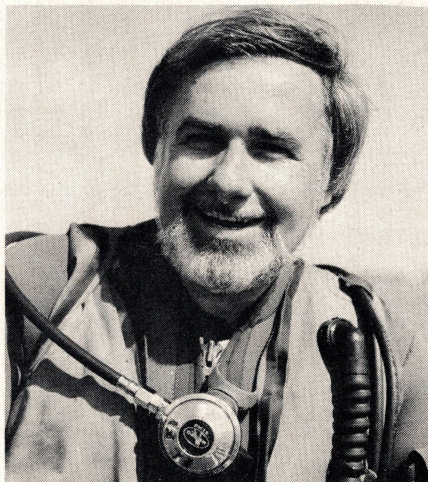
COVER

San Salvador divemaster, Al Zamrok, salvages a large anchor with lift bags. Geri Murphy used a Nikonos III with a Nikon 7.5 mm fisheye lens in a Seacor Super-Eye dome. A Light Handle provided 180° lighting.

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SDM Editorial

BY THE PUBLISHER



AN ACCIDENT AVOIDANCE PROGRAM

Avoiding accidents is unquestionably one of the major concerns of the diving community. At times it seems as though we are preoccupied with the subject, and perhaps rightly so. Because we are involved with an alien environment which can sometimes be harsh or unpredictable we must constantly strive for near perfection.

Few sportsmen are as conscientious about safety as the diving community. Scuba instructors devote the major portion of their training to safety and survival in open water. The textbooks are loaded with plans, procedures and rules which are all safety oriented. The equipment we wear today is basically designed with safety as the primary consideration, and most innovations such as BC's and octopus rigs are the outgrowth of accident prevention efforts.

Yet, with all of this emphasis and attention to scuba safety, there is still only one effective way of avoiding or preventing dive accidents. The key is the individual diver — you. You must be totally aware of the situation around you and fully know yourself. Accidents don't just happen, nor are they a result of bad luck. Psychologists who study accidents have discovered there are certain causative factors which frequently form a pattern for an accident. Many seemingly senseless or idiotic mistakes may actually have a very logical origin. People often do stupid things because they are not thinking straight or are not themselves. Being aware of distractions or abnormal influences can be the key to preventing an accident. Here are just a few ways that you can dive defensively and perhaps avoid an accident:

Be properly equipped. If you discover that a vital piece of dive gear is broken or you have forgotten to bring it along, abort the dive or at least postpone it until you

can borrow a replacement. Going into the water with a broken submersible pressure gauge or minus a depth gauge is really asking for trouble.

Keep your gear in working order. There is nothing more upsetting or distracting than a regulator which starts free-flowing or acting funny in the middle of a deep dive. Keep your regulator in good repair and well tuned. Also check your BC frequently for air-tight integrity and make sure your gauges are accurate.

Avoid drugs and drinking prior to diving. Narcotics and alcohol severely reduce your ability to react quickly in an emergency situation. They also impair good judgement and are frequently the root of human error. Even a hangover from the previous night can severely affect your ability to dive. Recurring waves of nausea, dizziness and vertigo underwater can lead to tragedy.

Get plenty of rest. Fatigue is one of the major causes of diver error, poor judgement and poor coordination. A sleepless night can lead to many mistakes.

Don't rush. Many dive accidents begin on the boat or beach. A diver who is hurriedly suiting up for the dive can frequently make mistakes or become forgetful. A regulator is not properly seated on a tank valve and blows an O-ring in the middle of a dive. A hose is not connected to a BC inflator; a depth gauge is forgotten; or a tank strap is not buckled properly. Don't let anyone rush you. Take your time and do it right.

Use a pre-dive check list. Most professional divers use some kind of pre-dive check list — some do it mentally while others refer to an actual written list. Check lists are simple but effective reminders. Airline pilots use them faithfully.

Beware of emotional stress within yourself. Depression, worry or brooding can be extremely distracting. You find your-

self making little mistakes because you are not thinking of what you are doing. Anger or frustration can make you impatient or careless. These are times when you must be particularly careful in your dive preparations. Force yourself to concentrate on your diving and leave your troubles on the surface.

Don't be afraid to abort a dive. Some people feel embarrassed about calling off a dive because they are afraid of what others might think. If the dive conditions appear dangerous or you are not feeling well, don't be shy about canceling the dive. Chances are that others may silently feel exactly the same way.

Don't become over-confident. Veteran divers are especially vulnerable to this hazard. Because they go diving in the same place and in the same way repeatedly, the dive routine becomes repetitious and almost boring. After awhile, they slacken up on safety procedures: start diving without a BC, never bother to take along a pressure gauge, or may even dive alone. Sooner or later the odds catch up with them because the normal routine is interrupted.

Stay in shape. Just because you are an experienced diver don't kid yourself into thinking you can outsmart the rigors of open water diving. It takes stamina and strength to cope with strong currents, a heavy surge or big surf. There is no substitute for regular exercise and either diving or swimming on a regular basis is one of the best ways to do it.

There is nothing new in what has been stated so far. Most of it is just common sense taught in every basic scuba class. Accident avoidance is solely dependent upon your being fully aware of the situation around you and being fully prepared to handle any conceivable emergency. Accident avoidance is strictly up to you, so why not dive defensively? 

Commercial Diving Is Serious Business



The demand for natural resources from the sea has never been greater. Twenty years ago, there were only a handful of offshore drilling rigs located in coastal and gulf waters. Today, there are thousands of deep-water platforms throughout the world. The need for qualified personnel to man and operate these facilities is ongoing. Your entry into the world of deep-sea diving will be a most prestigious and rewarding career. *Not only is there a demand for divers in the oil industry, but underwater construction, salvage, farming and environmental awareness need trained technicians also.* Your first step to employment as a commercial diver is training.

Divers Institute of Technology (DIT) was founded by men who have successfully met the challenges of inner-space. They know from experience what it takes to get the job done. Retired Navy and professional deep-sea divers joined forces over 13 years ago to establish a commercial diving school that would train and graduate only qualified entrants to the industry. The success of the DIT program can be measured by our physical growth, the credentials we have attained, and not only the number of top workers we have supplied to major commercial diving firms throughout the world in the oil industry, but to companies in

salvage and repair, inspection, underwater farming, etc. *We do not specialize only in the oil industry as some schools do.*

Divers Institute of Technology developed a six-month course that set an industry standard. Training is based on a highly sophisticated deep-sea diving program that prepares you both mentally and physically to enter this new environment. Our curriculum has been designed to prepare you for gainful employment in *all fields of commercial diving, not only in the oil industry.* Classroom instruction deals in facts and theory. Open water instruction gives you the practical application of classroom techniques. *The culmination of your training is actual dives to depths of 200 feet. To our knowledge, we are the only commercial school that puts you to this test. The confidence gained from this experience is unequaled.* Before you decide which school to attend, check this point out. Many schools provide only simulated deep dives in recompression chambers and diving tanks on dry land.

After proper training and graduation, you are prepared to enter the commercial diving field. It is then that you will realize a great deal of responsibility comes with the territory. Responsibility to perform the tasks you were trained to do! Responsibility to your diving team and responsibility to all support personnel. *DIT will not graduate a student unless confident he possesses the ability to become a qualified commercial diver.*

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October 16-17 Fifth Annual Underwater Film Symposium, sponsored by the Rockford Divers Association and featuring Paul Tzimoulis. Holiday Inn, South Beloit, IL. (Contact: Bill Steinborn, 1385 Randall Dr., Rockford, IL 61108; (815) 332-4225)

October 18-23 Recognition and Management of Diving Casualties course, Travelodge Tower, San Diego, CA. (Contact: Edith Bookstein, Office of Continuing Education, M-017, UCSD School of Medicine, La Jolla, CA 92093)

October 21-23 Annual meeting of the North Pacific Chapter of the Undersea Medical Society, Benson Hotel, Portland, OR. (Contact: Dr. Joseph A. Parent, Jr., Mt. Hood College Center, 10100 N.E. Prescott, Portland, OR 97220)

October 24-25 Second Annual Scientific Meeting, Great Lakes Chapter Undersea Medical Society, State University of New York at Buffalo. (Contact: William J. Lawrence, Hyperbaric Research Lab., Sunny at Buffalo, Buffalo, NY 14214. (716) 831-2760)

November 1-6 In-Depth Diving Seminar on Catalina Island, CA. Presentations and practice sessions on advanced dive skills. (Contact: Jon Hardy, Argo Diving Services, P.O. Box 1201, Avalon, CA 90704; (213) 510-2208)

November 7 Fifth Annual Dive New Jersey, Rutgers University. Sponsored by the New Jersey Council of Diving Clubs and hosted by the Rutgers University Scuba Club. (Contact: Joe Pakan, 221 A Bradford Ave., Cedar Grove, NJ 07009; (201) 857-1321)

November 13-15 The twelfth NAUI International Conference on Underwater Education (IQ 12), Toronto, Canada. (Contact: NAUI-Canada, Box 510, Etobicoke, Canada M9C 4V5; (416) 667-3817)

November 14 Gillmen Club Underwater Film Festival, East Catholic High School auditorium, Manchester, CT. Stan Waterman will be the featured speaker. (Contact: Bob Bockholdt, c/o Inner-space Diving Supply, 598 Center St., Manchester, CT 06040)

December 4 Thirteenth Annual San Diego Council of Divers Awards Banquet. Door prizes, photo contest and unusual entertainment. (Contact: James "Leroux" Redman, P.O. Box 9259, San Diego, CA 92109; (714) 283-3628)

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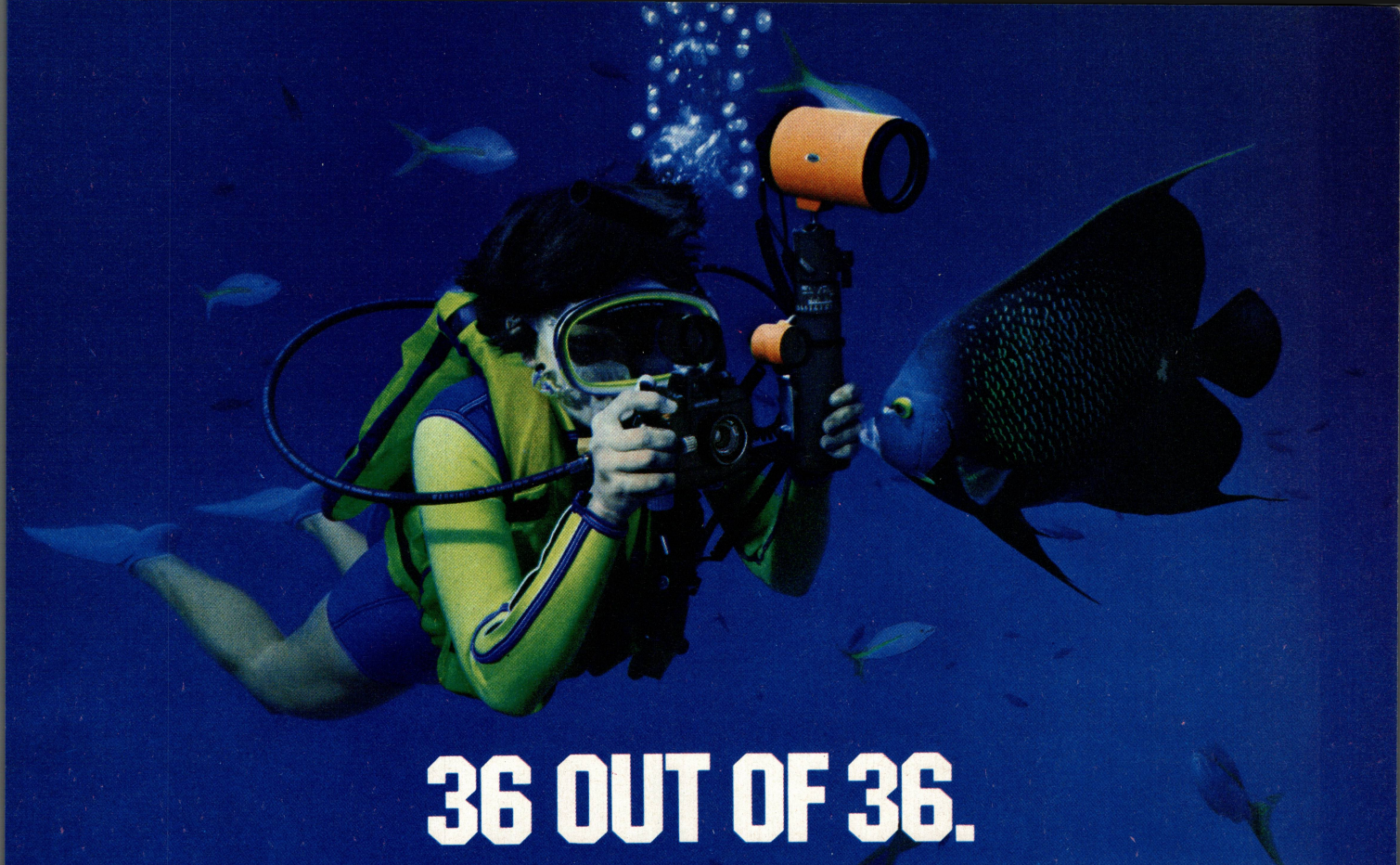
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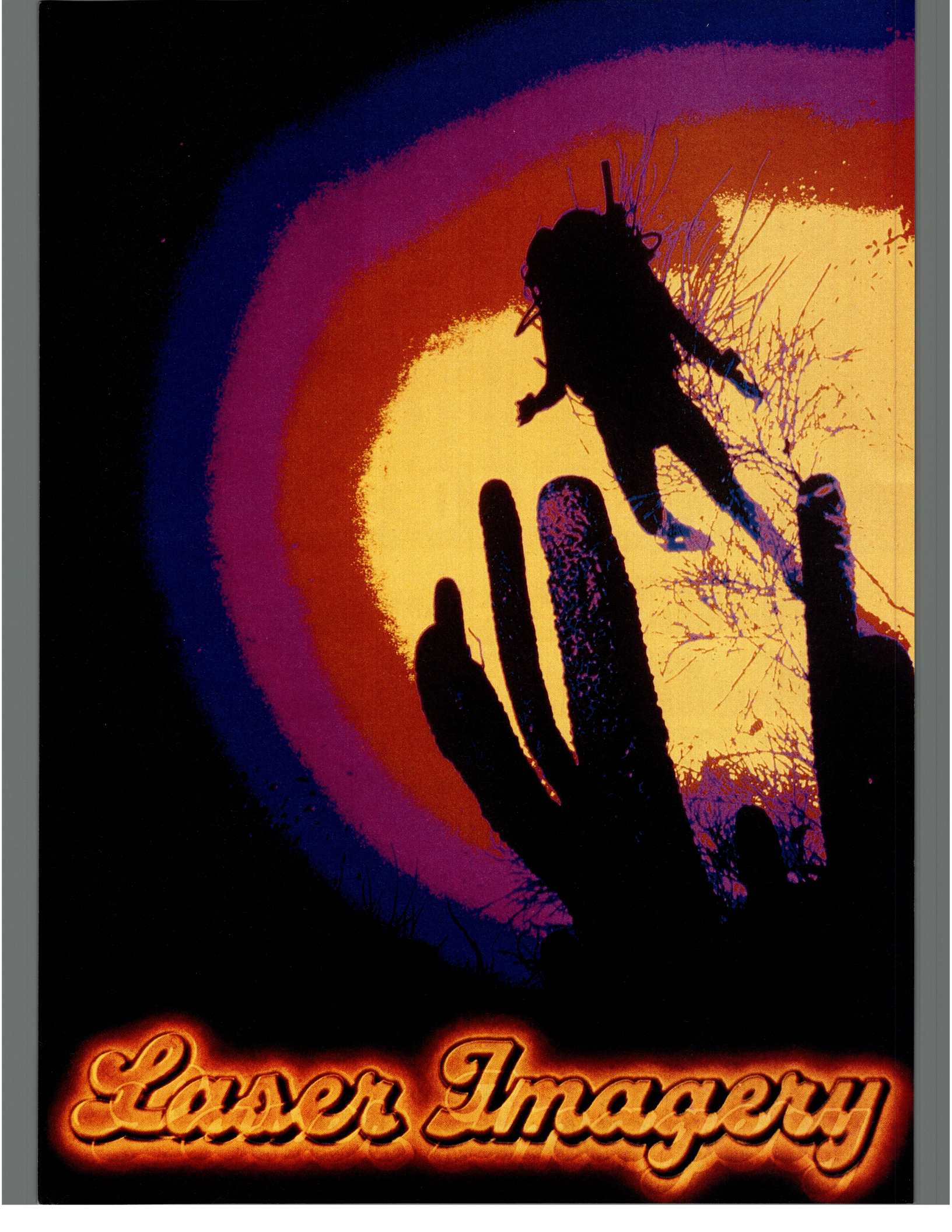
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Lower Imagery

A totally new method of producing super, dynamite images from ordinary underwater color slides has been developed by LaserColor Laboratories. By use of the latest electronic laser technology and specially developed equipment, your color slide can be transformed into a posterized color print in a matter of minutes.

This new technology allows needle point fine beams of red/blue/green light from low powered lasers to rapidly scan through the emulsion matrix of a color slide and to translate the perception electronically by analog processing, and to then immediately transmit that color information onto the emulsion of sensitized color print paper, using other laser beams.

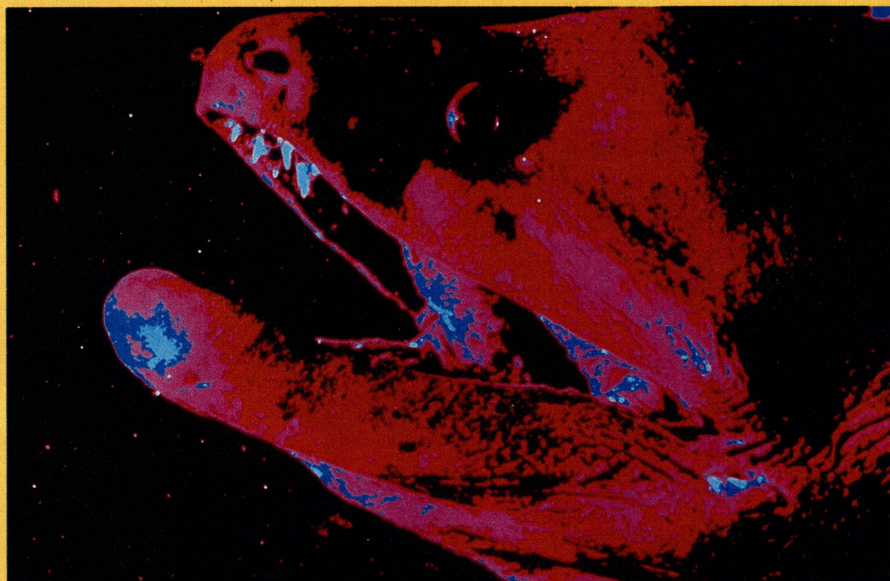
My introductory visit to LaserColor Labs began by viewing a mind-boggling assortment of posterized prints displayed on the office walls of Don Land, a senior design engineer, who first had the idea, and who then took a major part of the development of the electronic laser technology involved. Don Land is a scuba diver/recreational underwater photographer who has worked for almost ten years as an idea man for Photo Electronics Corporation, the parent company of LaserColor Labs. Four years ago an article in the May, 1974 SKIN DIVER had been brought to his attention. It contained a full explanation of the process of conventional photographic posterization of color slides. The article inspired him and stimulated his imagination. Could this same posterization technique be accomplished electronically?

Don knew his company was using electronic laser technology and analog processing science to transfer an image from the emulsion of a color slide to produce a true-color exact image enlarged print. It occurred to Don that the two processes could probably be combined. He took his idea to general manager Jim Shepherd and was given the go-ahead to work on this new project. Three days later the breakthrough was made and the special effects Laser Color Art Print was born. What did Don use to experiment with? His own underwater color slides, naturally.

The next step was to put together a previewer into which a color slide could

Space Technology Produces New Form Of Photo Art

Text and Photography
by Dick Harrison



Right, the original color slide was a close-up of a green moray. Above, the resulting posterization is a startlingly colorful burst of red, pink and black. Even backscatter adds a special effect.



Right, this original was a scenic shot of a diver and pillar coral. The posterization produced in this case shows high contrast of cobalt blue and black against highlights of light blue, yellow and red.



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LASER IMAGERY

be inserted and the laser color image viewed upon a screen. The hardware that resulted looked like a medium sized metal box connected to an ordinary color TV set. Instead of lasers, the previewer used cathode ray tubes emitting the red, blue and green portions of the visible light spectrum, much as does the color TV set in your home.

It was found that a total of 13,824 different special effects could be achieved from any one color slide through slight adjustments of these three colors in combination with: each other, two choices of posterizations, and four choices of contrasts. These image alterations ranged from the most subtle to extremely psychedelic creations.

A newly improved previewer has just been developed and is expected to be available beginning this year. The plan is for 25 of these new models to be located in major metropolitan areas in the United States.

If you can gain access to a previewer, a trained person can readily explain the operation, and suggested formulas for various special effects combinations will be offered for your consideration. You will also have the opportunity to allow your own creative imagination to run free and you can come up with your own formulas.

If a previewer is not available in your area, the lab has a special offer: Send in a cross-section of your 35 mm color slides. You will receive back five full image preview prints, either all five from one slide, one print from each, or any combination that results in five special effect prints. When ordering, you can furnish the formulas that you have obtained from the previewer, or you can leave it up to the lab technicians to choose a painting effect such as: a five tone gray, a high contrast negative black and white, an extreme psychedelic, a black and white laser solarization, or one of thousands of possibilities.

Other alternatives allow you to describe the colors you want in the special effect image, or decorative color scheme requirements. You can even send in paint chips or swatches of materials to show the colors to be incorporated in the prints. With those thousands of color combinations available, almost anything is possible.

The color photographs printed with this article have been specially selected to give the underwater photographer a head start in visualizing just a few of the possibilities of this new posterization process.

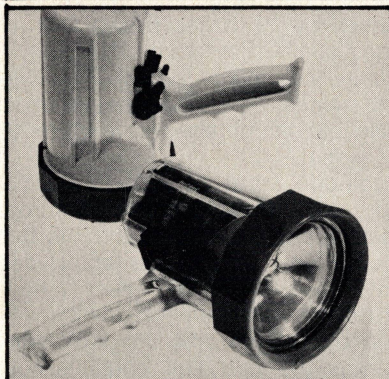
These photographs are among the first to be printed from color separations that were made from special effect

STANDARD



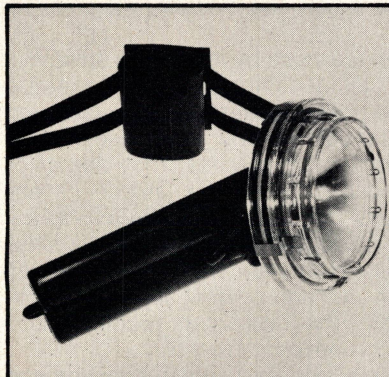
MINI C-LITE I

The Mini C-Lite I, 5" long x 3" diameter is designed to operate with 4 "C" cell alkaline batteries (not included) and a standard flashlight bulb. This combination provides 4 to 6 hours of light with twice the intensity and coverage of similar size lights. A rotating ON/OFF switch offers easy one hand operation. The light's size and the optional (#1056) rubber holster offer unlimited mounting applications. Lite is available in black, clear or orange.



IKELITE II

The total concept of this Lite is simplicity in design, for trouble free performance and long life. The IKELITE II features a unique ON/OFF switch and lock. The lite operates from a standard 6 volt battery (not included) and a #4546 sealed beam bulb. Unquestionably the brightest and most dependable diving light in its price range. Lite is available in black, white or clear.



C-LITE I

This Lite offers 50% greater intensity than lantern battery powered lights. The special sealed beam bulb requires six "C" cell alkaline batteries and produces 10,000 initial candle power as compared to the 6,000 candle power of our IKELITE II (non-rechargeable) and other lantern battery powered lights. The compact size and unique shape offer easy one hand operation. This Lite can easily be carried on all dives in the Optional (#1055) C-Lite Holster.



MODULAR I LITE

This Lite utilizes six inexpensive "D" cell flashlight batteries (not supplied), to provide intensity unequalled by any popular priced diving light. Lite can be converted to Modular X, SuperLite, or MovieLite. Available in black or clear.

MODULAR X LITE

This Lite utilizes a more powerful bulb which requires six alkaline "D" cell batteries. This combination produces an intensity almost equal to rechargeable lights in the \$100 price range. Lite can be converted to SuperLite or MovieLite. Available in black or clear.

RECHARGEABLES

MINI C-LITE II

This new lite offers the same features as the Mini C-Lite I, compact size, virtually indestructible case, unmatched intensity, one hand ON/OFF control, plus 4 "C" cell nickel-cadmium batteries and charger. The nickel-cadmium batteries provide a constant intensity for approx. 2 hours on a full charge and recharge in 12 to 16 hours. The Lite's size and the optional (#1056) rubber holster offer unlimited mounting applications. Lite is available in black, clear or orange.

IKELITE II

A rechargeable Lite in the mid-price range. This new Lite offers the same unique features as the famous IKELITE II, plus a rechargeable gel-cell battery and charger. The gel-cell battery is considerably more powerful than a standard lantern battery. It powers a special #4645 lamp, producing four times the intensity of lantern battery lights. The gel-cell battery provides a constant intensity for approx. 2 hours on a full charge and recharges in 10 to 15 hours. Lite is available in black or clear.

C-LITE II

One of the brightest rechargeable Lites in the diving industry. The clear push on cap allows easy opening and sealing, and the o-ring can be seen at a glance. This Lite comes complete with ni-cad batteries, charger and has a safe working depth of 800 feet. The special ni-cad batteries provide a constant intensity for approx. 1½ hours between charges. The compact size and shape offer easy one hand operation. This Lite can easily be carried on all dives in the Optional (#1055) C-LITE Holster.

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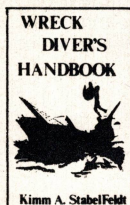
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LASER IMAGERY

color transparencies (color slides). The LaserColor Laboratories also offers special effect color slides, made from your original color slides. Your slide is returned unaltered, except that it will have been professionally cleaned and remounted as part of the technical processing. The original mounting is saved and also returned to you.

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If you don't want the entire image that is on your slide, you can provide cropping instructions to the lab and only that portion of your slide will be reproduced as a posterized special effect. I have seen startlingly dramatic results obtained by cropping the images of divers, sponges and soft corals silhouetted below the surface image of the sun.

Let me close by telling you something that I learned through trial and error. Underexposed (extremely color saturated) slides do not lend themselves to this special effect process. They are simply too dense. The more latitude in tonal ranges (from light to dark) you have in your slide, the better. Contrasty slides with both light areas and dark areas are okay, as are overexposed (too light) slides. The latter can produce some wholly unexpected results.

For a price list and further information, you may write to LaserColor Laboratories, P.O. Box 8000, West Palm Beach, Florida 33407.

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The newly opened Baltimore Aquarium at Pier 3, Pratt Street, will be the site of a party to benefit the Muscular Dystrophy Association. The party will take place on October 28 from 7-12 midnight.

In addition to enjoying the Aquarium, those attending will meet a host of diver/celebrities including: Norm Lewis, weatherman for WBAL-TV; Tom Sweeney, of WMAR-TV; writer Chris Hohenstein; and Ken Huff and Bob Pratt of the Baltimore Colts football team.

Cocktails and hors d'oeuvres will be served. The cost of the evening is \$12 per person or \$22 per couple. Senior citizens' tickets are \$8 and children under 12 can attend for \$6.

For information and tickets contact: Divers Den, 8105 Hartford Rd., Baltimore, MD 21324; telephone (301) 668-6866

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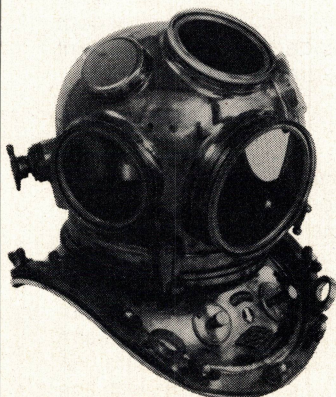
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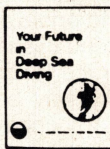
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Ikelite baseplate

Farallon/Oceanic tray

Flash Baseplates

Your U/W Flash Can Be Adapted To Fit
New Nikonos IV Text and Photography by Geri Murphy

Underwater photographers will be relieved to know their underwater flash units can be adapted to fit the new Nikonos IV design. Farallon/Oceanic and Ikelite, the two largest manufacturers of underwater strobes and photo accessories, have both introduced flash trays designed specifically for the Nikonos IV.

The Farallon/Oceanic tray is a forged aluminum bracket, 8½ inches long, ½ inch thick and coated with a tough baked-on paint finish. The bracket is drilled for the ¼ x 20 screw mount on the bottom of the Nikonos IV. A specially molded flange fits over the flash connector, providing a second mounting point for locking the tray solidly in place. The opposite end of the tray is fitted with an anodized

aluminum shoe mount that will accept any of the standard Oceanic ball-joint flash arms. The tray retails for \$36.

Ikelite has developed a simple stamped aluminum tray for the Nikonos IV that is made of 1/16 inch thick aluminum with a black anodized finish. The tray is formed to fit around the front of the Nikonos IV camera and is drilled to fit the ¼ x 20 anchor screw on the base of the camera. At the opposite end there is a ¾ inch diameter hole drilled to accommodate any of the standard Ikelite flash arm mounting devices. The aluminum tray retails for \$19.95 or is available with the Ikelite Solid State Triggering System for \$39.95. Both of these brackets are available at dive stores.

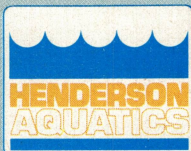
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RX FOR DIVERS

BY CHARLES V. BROWN, M.D.

arate occasions in the past few years. He considers diving almost essential to his career, and has obtained clearance from both his general practitioner and a cardiopulmonary specialist. Then he saw our article, Lungs Under Pressure, in the March issue and is worried all over again.

Answer: This all too common story is a reminder that even excellent physicians, if not trained in dive medicine, may give inappropriate advice. All authorities we know consider spontaneous pneumothorax a definite contra-indication for further diving. There's a good chance for a third episode and the stresses of diving probably increase the chance. Most im-

no problem, but the tracheostomy will. You'll need an adapter to connect your regulator to the breathing hole in your neck. Such a device is not commercially available and will have to be custom made. If the airway above the tracheostomy is not open, you won't be able to clear your mask. If it is open, you'll have to block the regulator exhaust ports before you can clear the mask.

Is the neuromuscular status of your throat normal? If water should enter through your nose or mouth would you be able to swallow it? If not, would you be able to cough it up? Doing so would also require blocking your regulator exhaust

The commonest cause of serious injury in young male scuba divers isn't barotrauma or decompression sickness. They don't even come close. It's automobile accidents. And all the victims have the same question: Can I safely resume diving? Our most recent correspondent sustained five broken ribs and a collapsed lung. After six months the second and third ribs have not healed, because the broken ends are too far apart from each other. Everything else is fine, and he's into a lot of athletics.

Answer: Have a chest specialist who knows dive medicine check for two potential problems. First, a scar in the lung could predispose to barotrauma by interfering with free and easy ventilation of some alveoli. Your doctor may advise tests to show partial air trapping. If they're positive, diving is out.

Second, unless the fractured ribs are fairly well fixed by fibrous tissue, that part of the chest wall may be unstable. If so, it will move inward when you inhale and outward when you exhale. This paradoxical movement will increase whenever resistance to breathing increases, as it does with any dive, and especially with a poorly tuned regulator, increased depth and exertion. Breathing efficiency suffers and the uneven inflation of the lungs might conceivably predispose to barotrauma. If your chest wall is unstable, an operation can fix it.

Question: A marine biology major in New Rochelle, NY has had a spontaneous pneumothorax of each lung on sep-

portant, a lung collapse on land is easily treated and rarely dangerous, while a collapse occurring at depth would become a probably fatal tension pneumothorax during ascent. If one wants to dive badly enough, he can have an operation on each lung to prevent any further collapse.

Question: Tony Backos of Merion Station, PA intends a career in marine biology, but worries whether he'll have a problem with diving. Two years ago a firecracker exploded near his left ear. Ever since, he has occasional ringing in the ear and, less often, a little dizziness.

Answer: The explosion damaged your cochlea, causing the ringing. This won't jeopardize dive safety, but if a dive accident should cause further cochlear damage, you may get more ringing and possibly impaired hearing too.

The dizziness means your vestibular apparatus also sustained damage. This could cause disorientation underwater, especially in conditions of turbulence or poor visibility. Before plunging down the price of a scuba course, be sure that your ears equalize pressure easily at the bottom of a swimming pool and that you don't get dizzy wearing a mask that's blacked out by a paper insert. Any instructor can help with these simple tests.

Question: Calvin Hoffert of Cheboygan, Michigan sustained a severe facial injury in July, 1980 and expects to have a glass eye installed. He's still breathing through a tracheostomy. He wonders about resuming his diving.

Answer: The glass eye should pose

ports. Not doing so would drown you. Don't dive until you've discussed these points with a physician familiar with both your own case and dive medicine.

Question: A fellow in Strafford, Pennsylvania is incensed because he's been turned down for a basic scuba course. It's his blood pressure. It's well controlled with three medications, and he passed the physical exam including an EKG stress test. His family doctor and a cardiologist both gave him the green light. The hang up is that his suspicious instructor insisted on an OK by a physician versed in dive medicine, and that doctor said no. The aggrieved wants another opinion.

Answer: Uncontrolled hypertension stresses the heart, so reduces its reserve ability to respond to a dive emergency. Controlled hypertension per se does not endanger a diver, but does introduce two areas of concern. The first is whether there are any complications — enlarged heart, arteriosclerosis, kidney disease, etc. — that might compromise dive safety. Your doctor can advise you on this score. The second is whether the medicines taken for control introduce a hazard. Some antihypertensive medicines impair the ability of the sympathetic nervous system to respond to emergencies. Others may alter the fluid and electrolyte balance in blood.

Many hypertensives can and do dive safely. If you don't qualify, discuss your case with the expert and see if your medications can be adjusted so that you do.

(Continued on Page 20)

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freeze up. A new "floating orifice" balancing system also assures steady pressure between stages.

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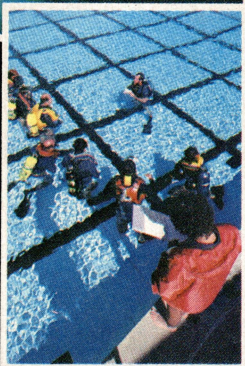
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In Memoriam CHARLES V. BROWN M.D.

By Bonnie J. Cardone

The dive community lost a valuable member on July 23, 1981 with the death of Charles Victor Brown, MD. Known affectionately as Charlie to his many friends, he was one of the world's foremost authorities on dive medicine.

Born June 24, 1926 in Philadelphia, PA, Charlie decided to become a doctor when he was 13. His mother died that year and Charlie always felt her death could have been prevented with better medical care.

He was only 17 in 1943, but the world was involved in a war. With his father's permission, Charlie enlisted in the Navy and became a medical corpsman. Discharged from the service two years later, he settled in Los Angeles and began his undergraduate studies at UCLA. He married Betty Lee in 1949 and the couple adopted her three half-sisters, Nancy, Linda and Patti. Before he graduated with UCLA's second medical school class in June, 1956, the couple also had two sons, Charles David (1953) and Harry Michael (1956). The entire family lived in a one bedroom apartment in UCLA's married housing.

After graduation, Charlie completed his internship at Riverside General Hospital. He was also chief resident there. In 1958, he opened an office as a family practitioner in the Riverside area. His wife was his receptionist until their daughter, Carol Ann, was born later that year.

In 1966, Charlie took the course that was to change his life and that of divers worldwide. He learned to scuba dive at Loma Linda University, certified by instructor Erv Mateer. He began writing articles for NAUI News about 1967 and soon became its medical editor.

In 1974, planning to spend more time with his family, Charlie closed his private practice and went to work as an emergency room doctor at Riverside Community Hospital. He continued to work there until his death.

Charlie's association with SKIN DIVER began in 1976. His first column, entitled Medifacts, appeared in the May issue. Monthly articles by Dr. Brown have appeared ever since. The column was extremely popular and generated a considerable amount of mail, mostly from divers who had problems their non-diving doctors could not answer. Charlie answered every letter sent him, either privately or in SKIN DIVER. So many letters were received and they took so much of his time that eventually they became the content of Charlie's columns. In a question and answer format, Charlie dispensed information and opinions on



a wide variety of topics including: contact lenses, mysterious rashes, the hazards of making love underwater and the possibilities of bends in a silicone breast implant.

As a result of his columns in NAUI News and SKIN DIVER, Charlie was invited to lecture and take part in medical symposiums all over the world. He took his dive gear with him, managing to combine business with pleasure in such diverse places as Israel, Alaska, Hawaii, the Cayman Islands and Australia, among others. Last winter he was a guest lecturer at Harvard.

The recipient of many awards, Charlie was honored by NAUI with the Leonard Greenstone award in 1977. This year, the U/W Club of Boston, calling him, "America's Diving Doctor," gave him the Paul Revere Spike award. Charlie was a member of the International Society of Aquatic Medicine and president of the Undersea Medical Society for 1980-81.

Although scuba diving and medicine were his greatest interests in the past few years, he held a third degree black belt in judo and loved to write poetry. Often humorous, these neatly typed missiles occasionally arrived in friends' mail, identified only by the initials, cvb.

On July 22, Dr. Brown left Betty a note telling her he was going to Laguna Beach to swim and study, something he did frequently. He indicated he would return after the rush hour traffic thinned out. When he hadn't arrived home by dark, a search for him was begun. His body was found in the surf in the early morning hours of July 23. The cause of death was officially listed as drowning.

A modest man, Charlie was shy and quiet. His unassuming manner sometimes concealed the wit that was readily apparent in his writing. Charlie was an editor's delight: his material was on time or early and trouble-free. Rx for Divers will continue to appear in SKIN DIVER until the backlog of Dr. Brown's material has been used. ➤

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The education you will receive at PDSNY is the result of work begun 30 years ago, and which continues today by a recognized expert in deep diving and submarine technology. Andre Galerne, founder and president of IUC, began his work in France as a diver in World War II, later joining Jacques Cousteau aboard the Calypso, there to begin his career of developing safe and innovative diving and submersible techniques.

IUC, which includes Mr. Cousteau among its board members, has become an international leader in underwater industry. It was the first to develop and utilize tri-gas breathing mixtures, and the first to compress divers deeper than 1,000 feet. Galerne's newest innovation, a hyperbaric diver transfer system, is being utilized in the North Sea. IUC developed the North Sea Hyperbaric Center in Aberdeen, Scotland. It is the only hyperbaric facility specifically designed for diver transfer, under continuous pressure, in an emergency medical or evacuation situation.

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To ensure the availability of professionally and properly trained divers, IUC established PDSNY. It was obvious that we would have to make significant changes in traditional diver training techniques if we were to find, train, and hire the kind of diver that IUC and the industry needed. The school is staffed by IUC's own diving supervisors under the direct management of IUC's training and safety department. You will be taught the highest standards of the industry by field qualified instructors.

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Our instructors are working IUC divers, submersible pilots, civil engineers and paramedics.

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We believe it is essential that our graduates have a working knowledge and skill in all areas required of commercial divers. Therefore, we include in our course tuition:

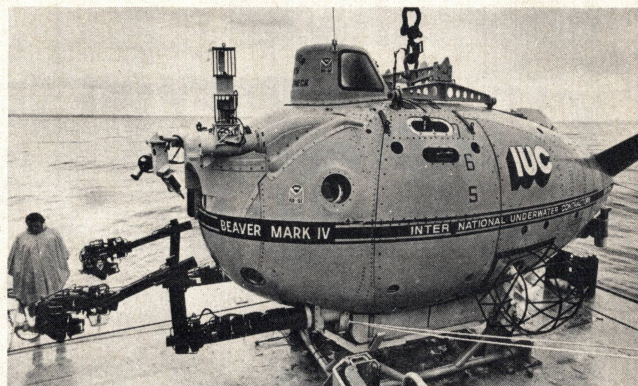
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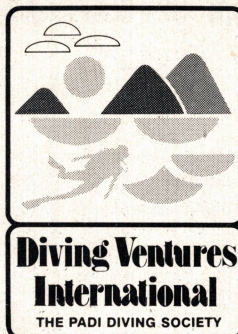
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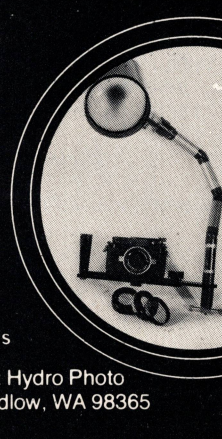
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RX FOR DIVERS

(Continued from Page 16)

Question: From Anne Zysk of Santa Barbara, California, a question and an appeal. Near shore, where a lot of swimming and diving went on, a propeller sliced four deep gashes in her leg. They healed, but there's a lot of scar tissue and some swelling. She questions whether these areas will be at increased bends risk. She appeals for boaters to be more watchful.

Answer: Traditional wisdom has it that previously injured areas are more susceptible to bends. Circulation is reduced within a heavily scarred area, and your swelling implies impaired venous and/or lymphatic drainage from areas beyond the injured sites. Such areas are slower to take on nitrogen and slower to give it up. Theoretically they should bend more easily after relatively long dives near no decompression limits. However, we've seen no convincing evidence that this happens. Dive medicine textbooks are vague on the subject.

Having very nearly been run down by a speeding boat, I heartily second your appeal. We should all try to spread the word that a divers flag is a warning to stay away, not an invitation to visit. The diver who flies no flag takes his/her chances.

Question: Robert Farfrak of Garrettsville, Ohio has had an operation for otosclerosis. Is it all right to dive?

Answer: With otosclerosis the innermost ear ossicle, called the stapes or stirrup, becomes partially fixed to the bony rim of the oval window. This dampens its ability to vibrate, and hearing is reduced. A sometimes successful operation replaces the stapes with a reasonable facsimile fashioned from metal or plastic.

We know of people who have had this operation and returned to diving with no problem. However, many authorities fear that unbalanced pressure might ruin the repair and so advise against diving. The truth is, we really don't know.



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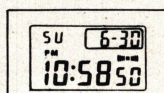
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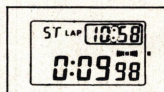
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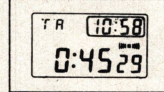
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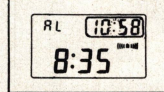
Normal time display: hrs./mins./secs., AM/PM, day, month, date, and 12/24 hr. time



Stopwatch Mode: 1/100 sec. timing, auto start/stop at 1 hr. lap time, lap and 1-2 finishes, normal time in upper corner



Countdown Alarm Display: Set from 1 min. to 11 hrs. 59 min., audible beep lasting 30 sec., normal time in upper corner



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ERCEAL DIVING

REVOLUTIONARY DIVE SUIT DESIGNED AND TESTED BY RON AND VALERIE TAYLOR

By Valerie Taylor

Ron and I have been working with sharks for more than 25 years. The idea of a steel mesh shark protection suit first interested Ron in 1967, while we were working as photographers on the Belgium Scientific Expedition to the Great Barrier Reef. One of the other divers was wearing a pair of Whiting and Davis butcher's boning gloves to protect his hands against cuts and scratches. Ron remarked that a suit of similar material could possibly deter an attacking shark and it was something we should think about trying. The material was basically an updated version of the steel mail worn by medieval knights. The suit was discussed whenever we had problems filming aggressive sharks. However, the idea was not put into practice until December 22, 1978. Ron had the first mesh suit shipped from the U.S.A. Although he planned to test the suit himself he found the mesh too restricting so I became the guinea pig.

Here is a segment from my diary about that first experience: "Once again I went down wearing Ron's shark suit. I am becoming used to the floppiness and the weight, which is similar to a normal div-

Valerie Taylor steadies husband Ron as he zips himself into the protective mesh suit.



Anti-Shark Armor That Works

er's weightbelt. This time we had a huge amount of fish bait, thanks to a couple of keen line fishermen on the charter boat. We had joined our fish together with rope and I tied them to a sturdy coral head in 20 feet of water. I took a position some 10 feet from the bait with my back against a coral outcrop. Ron, movie camera ready, placed himself on the opposite side.

"Gray reef sharks appeared in minutes; sleek, fat and fast moving. Circling like a pack of dogs, they appeared over-cautious. Perhaps having the bait between us made them initially more apprehensive than normal. One, braver than the rest, broke free from the pack, moving closer.

"With almost a casual air, she passed the bait twice, then turned back fast as Carcharhinids so often do, eyes white,

nose retracted, mouth a saw-edged tunnel. As she hit the bait it exploded into a bloody mince.

"Sounds of teeth-against-bone filled my ears. I felt lonely, but held my ground. A second, then a third, triggered by feeding vibrations, rushed in fighting for the fish. One tore a lump of flesh free and fled with her prize.

"Blood fogged the water in green clouds as other bait disintegrated between those terrible ripping, tearing teeth. More sharks came. I was surrounded by sharks, blood and gore. I waited to be attacked. I expected the hit with every atom of my being, but it never came. One fat female brushed my leg, then flicked immediately away from the alien metal.

"For 10, perhaps 15 minutes, I re-

mained close to the bait. The sharks, aware of my presence, avoided contact. It appeared that even during the frenzy of seemingly out-of-control feeding, some instinct warned them to give me room. I made no aggressive movements, nor did I knowingly do anything that would frighten them. They simply did not like me, and there was really no reason they should. I was offering neither food nor danger. I was simply there."

During the trip we tested the suit in similar situations as frequently as possible. Ron always recorded what happened on film. I was touched on only three occasions. Always, it appeared accidental and each time the gray reef shark darted away, startled. I never endeavored to provoke an attack, either by aggression or baiting myself. I just

placed myself in close to the action and, as humans with or without a mesh suit are not normal shark food, the negative results of these tests were somewhat to be expected.

We continued this type of experiment for another year. Although sharks felt the mesh with their teeth on several occasions, none would attack in a determined fashion. Even the normally aggressive wobbegongs seemed more distressed than angered by our efforts to force mesh covered mackerel into their mouths.

It wasn't until June 7, 1980, while working off the 70 foot *Sea World* from San Diego, California, that we finally succeeded in coaxing sharks into attacking us. Assisted by the suit's co-developer, Jeremiah Sullivan, these experiments were extremely successful, but more proof of the suit's protective qualities was needed. Also, it was important to work with other species of sharks. The following story is about our third series of tests, which took place in the Coral Sea 300 miles from the shore.

TESTING IN THE CORAL SEA

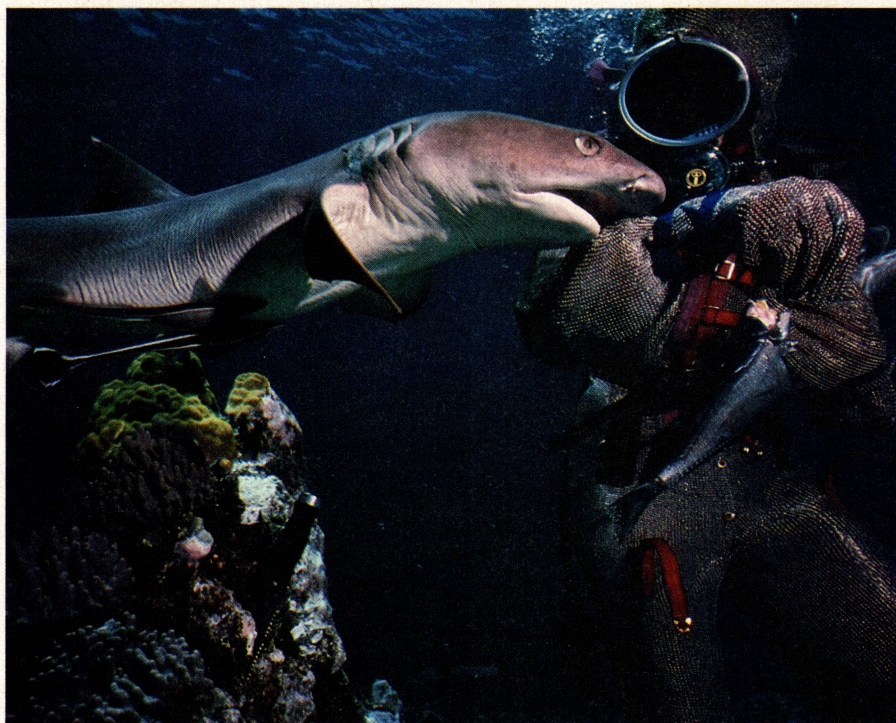
In October of 1980, we are on board the charter vessel *Coralita*, plowing across a glass-smooth ocean toward Marion Reef, 300 miles off the South Queensland coast. Ron and I plan to work extensively with our shark suits. There have been some alterations made to mine and it fits better than before. We hope to test the mesh against whitetip reef sharks (*Triaenodon obesus*) and gray reef sharks, (*Carcharhinus amblyrhynchos*).

There should be no problem in getting the aggressive little whitetips to bite, but gray reef sharks, while potentially more dangerous, have nervous personalities. Once they have been seen by the diver, they are rather wary. Wally Muller, our skipper, has 300 pounds of fish in the freezer for us to use as bait. Hopefully, this will make them a little braver than usual.

If we can get the gray reef sharks to bite, it will be an excellent test for the suit. They are roughly the size and type of shark responsible for the majority of unprovoked attacks on humans in Australian waters. The great whites, surprisingly, are the cause of a relatively small percentage of shark attacks, not only in Australia, but on a worldwide basis.

DAY ONE

The first day we conduct a preliminary workout in Coralita Pass with the sharks. We have always found good sharks here and today was no exception. There must have been over a dozen gray reef sharks,



photos/Ron Taylor

A whitetip reef shark (*Triaenodon obesus*) explores the steel suit with its sensitive mouth and nose, trying to locate the source of the fish odor filtering through the mesh. Valerie had placed pieces of fish between the metal suit and her wetsuit as shark bait.

averaging from five to seven feet in length. Also, we saw several whitetips. Ron and I are going to try the suits here tomorrow. Wally Muller's 18 year old son, Alexander, will be assisting us.

DAY TWO

The second day. We take two bags of frozen fish and go back to an opening in the side of Coralita Pass. We had successfully lured in sharks here on other trips. Ron selects a small coral outcrop under 30 feet of water right on the edge of the channel. Alexander ties some fish to it. The gray reef sharks begin to appear almost immediately, so we return to our aluminum dinghy, Ron to get his cameras and me to put on my shark suit. Alexander helps me and we stuff quite a few pieces of fish inside the sleeves of my suit. I hope to concentrate any possible attack on my arms, where I can see what is happening.

Several freshly caught trevally are tied to the mesh near my shoulders, and I hold another. Feeling rather like a shark's idea of Christmas, I roll out of the boat and descend into the pass.

It is a fine place for photography. Light reflects from the white bottom and a steady current carries away the fine sand our flippers stir into the water. I begin to grate fish into the current. Gray reef sharks glide up from the channel, circling nervously. They live in the pass, feeding on fish moving in and out of the



This whitetip reef shark tenaciously hangs on to a mouthful of mesh-covered fish and arm.

lagoon. It is their home and their hunting grounds. Any unusual activity is an attraction to be investigated. A whitetip appears, not from the deep water as the gray sharks have, but over the shallow coral reef. She is a nice sized shark. An injury has deformed one side of her face, giving her a lopsided, angry look.

Two more whitetips appear — one about four feet long and one slightly smaller. These are good sharks to start working with; not too big and not too many. Although whitetips have been responsible for only two attacks in Australian waters, they have large mouths and several rows of sharp triangular teeth. I would hate to be bitten by a whitetip — they often rip the fish in half rather than bite it — but, their lack of fear has always made them easy to film.

It is unlikely that the gray reef sharks will cause a problem because of our closeness to the bait and their cautious natures. The large deformed whitetip shark is the bravest. She nuzzles about looking for food, poking her blunt head into the coral around my legs and once even pushing between my tank and rear.

I offer her my arm several times, but she ignores it, turning her head away. Her calmness is exasperating. She knows what she is after and has little interest in the large creature in her way. To my surprise the smallest shark quite suddenly dashes in, without preliminaries, and grabs my arm.

I am not prepared and automatically jerk my arm away, leaving the shark with a mouth full of mesh covered trevally, which oozes mashed fish into his mouth. Unable to tear the fish away, the whitetip goes into the uncontrolled spinning action so characteristic of this species. The mesh screws tight around my arm.

With a nasty grating, the little shark's bottom teeth begin breaking off in the mesh. Until now, he has shown no hesitation at all, but he slows down, does two more half-hearted spins, and after a short rest just holding the mesh, he releases his grip. He turns instead to a small piece of fish lying on the coral and snatches it up happily. It's interesting to note that this particular shark (now distinguished by his bloody mouth) does not attack or take a bait again, although he continues to circle for the next hour.

Scarface, who is a good five feet in length, moves in again. She is now more excited, no doubt due to the feeding vibrations of her comrade. When I offer my arm, she grabs it with great gusto. It's rather amazing to watch a shark trying to bite your arm off, the razor teeth crunching, crunching. The sound is incredible. Fish ooze continues to squirt through the mesh and the shark, frantic now, tries harder and harder to penetrate, holding with her bottom fangs and sawing with her top teeth.

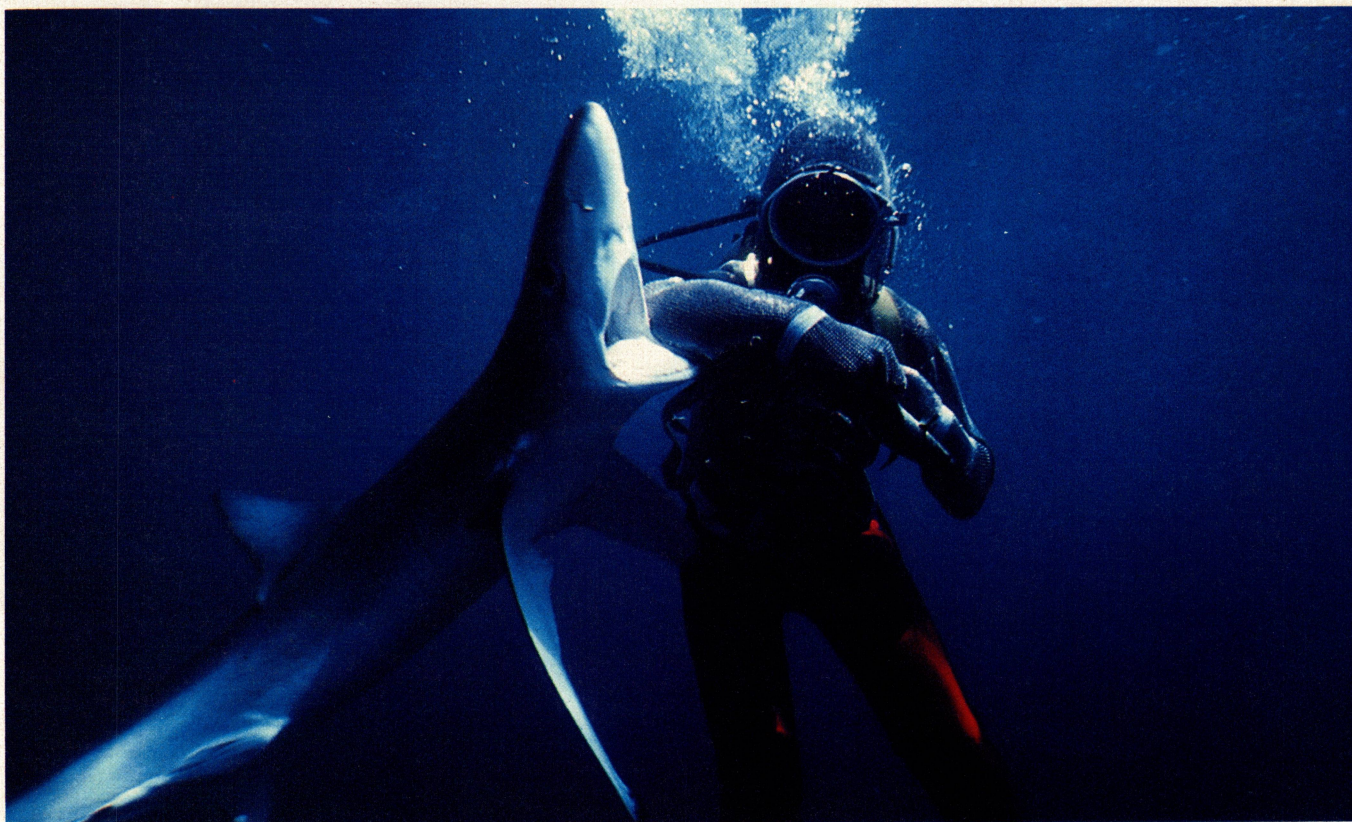
I watch as she works her way down my arm, never quite letting go, the bottom

holding teeth always penetrating, keen to find a vulnerable area. I realize that unless the bottom holding teeth penetrate well, the whitetip does not spin, but sort of chews, looking for a good grip. This is proven again and again during the tests. The first shark that spun so dramatically actually had a mouth full of mesh which in turn was full of fish. There had been no arm, just extra sleeve. Also, it was and still is the smallest shark to ever bite me and perhaps his bottom teeth were tiny enough to penetrate the mesh and give him a firm grip.

Time and time again the sharks bite me. I try to keep the action concentrated on my arms, but they chew me all over the place. One even bites or tries to bite the side of my head. The suit holds well. One link breaks on my right arm. Scarface, at first the main performer, learns after about six attacks that her original instinct regarding me is correct. She feels something isn't right and begins sniffing my body up and down, feeling with her nose and lips. If I try to force my arm into her mouth, she clamps it and her gills shut, turning her head away like a spoon-fed child who doesn't like his food. She is not afraid or angry, but patiently persistent in her efforts to locate the source of the fish smell filtering from my person.

Another interesting characteristic that becomes very apparent as the attacks continue is the method of release used by these sharks. Most species of shark have

A blue shark (*Prionace glauca*) exhibits a classic shark attack pattern with arched back, raised nose and pectoral fins sweeping forward and down. Valerie offers her arm to the gaping jaws in an action which would be suicidal without the protective steel suit.



the ability to retract their teeth into their gums for protection and comfort. Whitetips are no exception. The first bite is always the best; they diminish in aggressiveness and length each successive time. With the exception of the first shark, who spun his teeth off, the others release their grips by withdrawing their teeth into the gums, opening their mouths wide and rather gently backing off. Although sharks' teeth regenerate when broken off, the whitetips obviously take care to break as few as possible.

Ron runs out of movie film and swims back to the dinghy for my still camera. On his return I hold a two pound trevally in my hand. Scarface grabs it hand and all. Finding the longed-for fish in her mouth, she really applies the pressure. Her teeth slice through the fish like butter, straight onto my hand. There is no protective neoprene, just mesh.

For an instant I think I am in real trouble, for it hurts, but it is only the pressure of her teeth driving the steel rings into the skin on my fingers. She drags the fish away, raking her teeth over my fingers. Later, when we inspect my hand, I am bleeding a touch from a finger and thumb, but the wounds are superficial, barely breaking the skin. Compared to what could have happened without the armor, it is nothing.

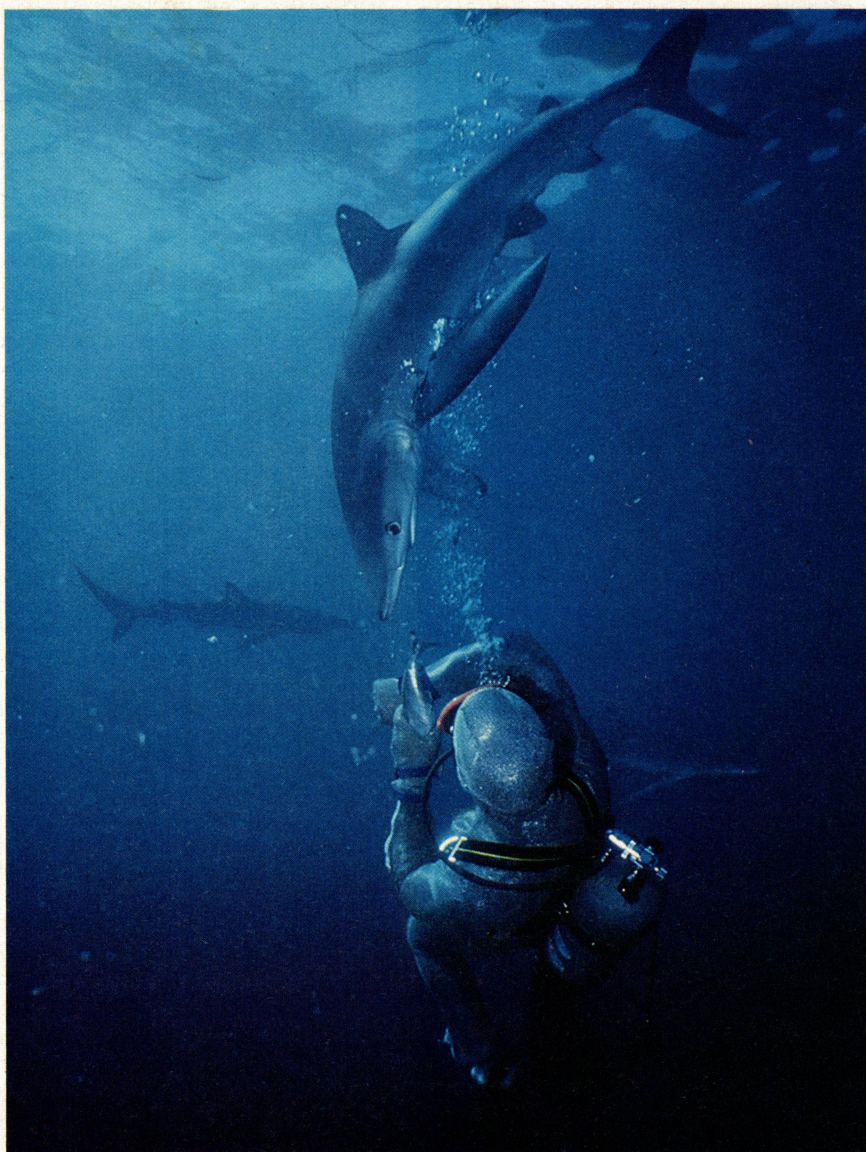
The shark suit has proven itself once again and my confidence in it is growing. Most amazing of all is how little pressure the sharks apply when they bite. There can be no doubt that the greatest danger is the cutting edge of the top teeth, which act like a saw when the shark vibrates, and the greatest pressure is the hit before the shark bites. Twice I observed whitetips bracing themselves against the coral with their pectoral fins to give more leverage to their sawing. When they did this, their bodies would remain relatively steady and they would jerk their heads from side-to-side in an abrupt motion. It would seem that only when there is no means of bracing their body against something solid do whitetips flay and flap around as they eat.

DAY THREE

Another nice day. Wally is taking the *Coralita* to Action Point. We have been there dozens of times in the past and always found good, active sharks.

Immediately after the *Coralita* drops anchor, we grab our cameras, dive gear, bait and take off in the dinghy for Shark Alley. We know it is going to be good because we have the skeleton of a 35 pound tuna as well as all of our other bait.

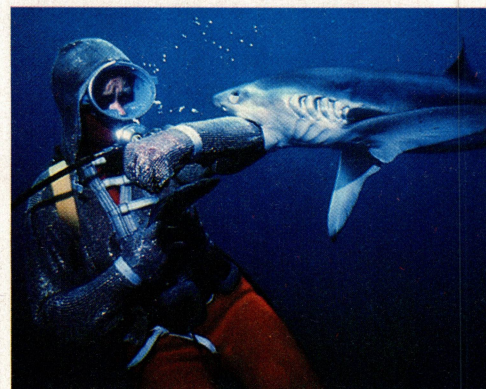
We anchor in a gutter running back from the drop-off. I begin to chum and a nice flow of fish pieces drifts over the edge. Almost as a warning of what is to come, a gray reef shark dashes up the chum line and in a weird sort of frenzy,



Jeremiah Sullivan entices a blue shark to his arm by waving a fish beside it

attacks the boat again and again. Sharks often bump or bite the boat, but this fellow's persistence is incredible. For once I am glad I will be wearing the suit. A trevally hanging over the stern on a rope breaks free and the attack halts. We decide the shark must have taken the fish. I put on my mesh suit. It's becoming almost normal dive attire for me now. At least I don't have to worry about a weightbelt when I am wearing it. Ron and Alex suit up also and we go over together. To our great surprise, lying intact on the coral is the blue trevally. Although I have my hands fairly full with the tuna, I pick up the trevally, knowing from past experience that it is always best to have all the bait in the one place so that the sharks stay together. It is beautifully clear. The reef rises and falls in weird, unsystematic shapes, older than man and far more durable.

The shallows open to deep blue water in a lopsided V. Fish waft through the stunted corals. It is a typical weather side



Valerie looks worried as this blue shark crunches down on her elbow. The shark also makes a face as it rolls its eyes upward and covers them with a protective membrane. This nictitating membrane is present in many species of sharks and shields the shark's eye from abrasion.

reef area. Alex swims down the polyp-made canyon into the blue beyond, trailing his gun. Although Ron chooses a work place inside the reef on a nice coral clump, I decide to follow Alex. I know what the boy is up to. There are no good fish to spear inside the reef, only parrotfish, which are not the best shark attractors. Also, I feel the action will be better on the edge of the drop-off, where the marauders have the security of a deep open stretch of water behind them to give them more confidence. Sharks, like all animals, have favorite places where they feel safer and drop-offs, with their vast, unknown depths, are some of them.

I swim to the canyon mouth and set up my bait on the left side. Alex has gone off to the right and I know that if he hits a fish there the sharks will have it before he can swim back to me. With great patience I move my bait over to the right side.

I can see Ron swimming toward me down the V. He positions himself on a small outcrop of coral, 20 feet down the side of the cliff where the light is good. He has a coral wall at his back. Sixty feet further down, the vertical wall ends on a sloping valley of sand and coral. Several large sharks, almost invisible against the deep water, move back and forth. There are big blue spot trout everywhere, more than are usual in the Coral Sea. Alex swims out over the deeper water and dives. Sharks are not as stupid as their small brain would indicate. They learn a simple lesson very quickly and anything concerning food or danger is not only remembered for years, but also somehow passed onto other sharks in the area.

As Alex reaches the 60 foot mark, I can see at least ten gray reef sharks moving in, ready for the kill. The local inhabitants have learned over the years that a diver with a speargun means helpless, struggling fish, just as a diver without a gun means very little and is generally not worth bothering about. We have made a rule not to catch or spear sharks around Action Point, so they will have no reason to develop a fear of man. This means that shark action can be guaranteed and any photographers or filmmakers wanting to work with sharks can find good performers without too much trouble.

The sharks, mostly five to six foot whalers and one eight foot silvertip, circle. Alex aims for a big, 20 pound trout. As the spear reached its cord length the sharks shudder and move faster for a second. Then, sensing the shot is a failure resume their circling.

It looks dangerous and is. Alex, like all of us who have done this sort of thing, relies on the speared fish ten feet away on the end of the spear cord to keep the sharks' interest at a distance. It nearly always works. I hope Alex will swim up fast if he hits a fish and would like to warn him although he already knows what I

want to say. He looks lonely and vulnerable as he reloads his gun.

His audience picks up speed as Alex drifts in on a trout. It is a good shot. Before the fish can reach the coral, Alex swims toward us, his following of torpedo shapes closing in for the kill, gray against blue, swirling, swirling. When the fish is almost level with me they hit, three together, others speeding up to join in.

There are more than we can count in the swirling, shuddering mass. I decide to swim into the frenzy — Why I cannot say. I just decide. Leaving the comparative safety of the ledge, I swim slowly, carrying the tuna. Sharks are all around me, moving faster than my eyes can follow, a mindless mass of snapping jaws and contorted bodies. I see shark, white, then black. A terrible blow to my face, terrible noise, grating, pulling, pressure. My air is gone. I am bleeding, hurt, fighting for consciousness. I turn toward Ron, unable to see because my mask has flooded. I clear my mask, sharks hitting, bumping, bashing; one has my leg for a second. I feel kicked, beaten, ready to die.

I reach for my regulator, it is gone. I find my useless pressure gauge. No air there. I pull away, struggling on, longing to slide into the peace of unconsciousness, but fearing it also. I am drowning. Ron is filming, but the sharks, not me. My face hurts. I reach Ron, grabbing for his air. Not knowing what has happened, he swings the camera onto me. I grab for his regulator, but can't reach it. I am almost finished. Fearing a blackout, I surface, fighting the weight of the suit, fighting blackness, fighting, fighting.

Ron films. I suck in air, but not enough. The suit drags me down. Suddenly a mouthpiece is jabbed into my mouth. I shut off, barely conscious and sink gently down, breathing, breathing, breathing. Air is my only desire. Ron films. I lie face down, spent, unable to move for several minutes. Not caring about sharks or anything, I suck invisible life from the tank. I relax, my breathing slows, I become aware of where I am. Ron is near me, trying to make me swim up. I oblige, feeling sick and dizzy. A shark has bitten my face and the suit saved me. A shark has bitten my leg and the suit saved it.

Back in the dinghy, Alex looks under my chin. I have four tooth holes. The tiny gap in the mesh where the hood comes together had been my weakness. There are two broken links in the mesh on my leg where the shark had hit me.

I ask Alex what he thinks happened. He says, "Valerie, you appeared to deliver yourself to the sharks, then they were everywhere, then I saw you swimming away. It was very quick."

Unlike most other sharks, the Carcharinids, which include the bull, bronze, silver and gray reef sharks, attack with

lightning speed. The two hits upon me happened in seconds. We have seen similar attacks on movie film shown us by Dr. Don Nelson. In this case the gray reef sharks hit a two-man submarine Dr. Nelson was using during research.

CONCLUSION

My whole jaw was sore for several days, making it difficult to eat and laugh. Then the pain subsided into a very tender bruised circle just under my chin, but if I didn't touch it, there was no problem.

I was not attacked again, in a similar fashion, during the week of experiments. On many occasions, though, I was bumped quite hard.

During later experiments, I had the opportunity to observe a gray reef shark giving me a thorough checking out. The creature sniffed me all over, bumping softly with the underside of the end of its nose. I guess it came in five or six times, ignoring the nearby bait. My light blue flash and blue fins received particular attention. The shark watched me as I watched it.

There was no fear between us, just great curiosity. I remained fairly still and endeavored not to breathe when the shark approached, trying not to frighten it. Although reef sharks bumped me in this manner on many other occasions, none made such an unafraid open approach. Most preferred instead to come up behind me. The first I would know of their presence would be a gentle push from the rear. Alex said he saw one about to swim past, suddenly flick its head sideways, bumping my thigh with its nose.

Both Ron and myself found the gray sharks attracted to our blue fins, but the whitetips seemed to ignore them. None of the silvertip sharks touched me, preferring to leave most of the nosing about to the gray reef sharks and whitetips.

There is no doubt that the shark suit saved my life when the gray reef shark grabbed my face. Without it the teeth would undoubtedly have cut my throat.

Ron, Jeremiah and I have never intended the suit to be used by other divers the way I did in these tests. However, in the type of unexpected attack I experienced, it could mean the difference between life and death.

Back in Sydney, my jaw continued to give me trouble. A series of x-rays showed a tiny tooth tip lodged near the nerve center under my chin. Because of its position, an operation is necessary to remove it. I have decided to leave it in place as a constant reminder of the day a shark grabbed my face. 

Editor's Note: Next month Valerie Taylor relates how she and Ron tested the mesh suit against the ocean's most feared predator, the great white shark.

The Subsea Mark 30, a new version of the Mark 25, has more than just a different body shell. The power supply has been increased and the electronics have been improved as follows:

1. The Mark 30 is powered by three alkaline or ni-cad C cells. This increases the power supply by 50 percent.

2. The capacitor (which stores up the electrical charge for the flash of light) has a higher rating: 350v and 400 microfarads vs. 330v and 350 microfarads for the Mark 25.

3. A voltage regulating circuit has been added to maintain an even voltage (plus or minus five volts) in the capacitor.

Subsea specifies that the Mark 30 will give up to 450 flashes of equal light output, and up to 1000 flashes at reduced power before the alkaline cells are completely exhausted. With ni-cad cells, the number of flashes can vary with the quality of the cells used.

TESTING THE VRC

After forming the capacitor (conditioning it with use) by recycling and flashing the strobe a couple dozen times, we attached a VOM (voltage-ohm meter) to the capacitor terminals and turned the strobe

on. In repeated tests, with both ni-cad and alkaline cells, the capacitor charged to 320 volts and held that level. The slight movements of the VOM needle, as the VRC (voltage-regulating circuit) turned on and off, indicated that the VRC did indeed keep the voltage level of the capacitor constant (plus or minus five volts).

We followed up with test flashes at a Wein WP1000 flash meter. Once the ready light turned on and glowed brightly, the measured light output of the Mark 30 was consistent regardless of the recycle time allowed. The measured flash intensities never varied beyond a one-third stop (f stop) range, which equaled the plus or minus one-sixth stop specified accuracy limitation of the flash meter. In our opinion, the VRC kept the light output virtually unchanged.

TESTING NUMBER OF FLASHES

We inserted a fresh set of Duracell alkaline cells, mounted the Mark 30 on a camera tripod, and aimed it at the flash-meter. To simulate four, 36 exposure photo dives a day, we flashed the Mark 30 a total of 144 times a day, for seven consecutive days.

We began with test flashes made in groups of 12, with the strobe being triggered about two or three seconds after recycling. It was turned off for several minutes between each group to allow the electronics to cool, and was turned off for an hour or more between groups of 36 flashes to simulate time between dives and days. We triggered the strobe with a Nikonos so we could use the film counter to count flashes.

By the end of the first day (144 flashes), recycle time had crept up to about 12 seconds, and all measured flash outputs were within the one-third stop range. After the second day (288 flashes), recycle time was about 14 seconds; and after the third day (432 flashes), recycle time was about 22 seconds for the last shots of each group. Light output was still stable.

When we reached the 468th flash on the fourth day, it took 25 seconds to get a brightly glowing ready light. The light output had dropped about one-sixth stop, but was still within the one-third stop range. At this point we concluded that the Mark 30 had exceeded the specified 450 flashes of equal power.

We continued the test flashes, but with a different goal. We now flashed the strobe before it completely recycled to see if we could achieve 1000 flashes at reduced power. If we flashed as soon as the ready light turned on, without waiting for the bright glow, light output was reduced about one-half stop. And if we flashed the Mark 30 before the ready light turned on, light output would be reduced by one or two stops, depending on how much recycle time was allowed. During this phase of the test, we had four misfires — caused by attempting to flash the strobe before it had recycled sufficiently.

At 999 flashes, we turned the Mark 30 off for five minutes to allow the batteries some rejuvenation time, then allowed the strobe to recycle for 90 seconds. When

The Subsea MARK 30



Below, the Subsea Mark 30 is powered by three disposable or ni-cad C cells. The MK 30 has an EO connector; the MK 30-II (left), a Nikonos II connector; and the MK 30-III fits the Nikonos III or IV-A.



Text and photography
by Jim and Cathy Church

flashed for the 1000th time, the light output was at the lower edge of the one-third stop output range established with the first flash. Although the Mark 30 would still recycle, Jim terminated the test. He had reached the advertised number of flashes, and was getting bored with hours of testing.

CONCLUSION

Apparently Subsea has wisely chosen not to expend the increased power supply and higher capacitor rating of the Mark 30 to increase light output. Both the Mark 30 and Mark 25 have U/W ASA 64 guide numbers of 24, and a 60 degree diagonal beam angle. Rather, Subsea has used the increased capacity to increase number of flashes, reduce average recycle time and to stabilize the light output.

With any strobe powered by alkaline cells, the advertised recycle time is usually for the first roll of film with fresh cells, and increases as the cells wear out. Thus, the recycle time of the Mark 30 increases, but this isn't as extreme as with some other strobes we have used.

From a practical standpoint, we plan on using a single set of alkaline cells for 12 cassettes of 36 exposure film (432 flashes) because this gives (in our opinion) the best compromise between number of flashes and recycle time. And for sustained use, we would suggest rotating two sets of cells so one could rejuvenate while the other was being used. The "up to 1000 flashes" capability would be our emergency reserve for use when the supply of fresh cells is depleted.

We didn't test for number of flashes with ni-cad cells because the quality and conditioning of the cells would significantly affect the results. We estimate, however, that ni-cads would give about half as many full-power flashes, but would probably maintain a six-second recycle time until the cells were exhausted.

To sum up, the Mark 30 is a tough little strobe that performs as advertised.

FOR MORE INFORMATION

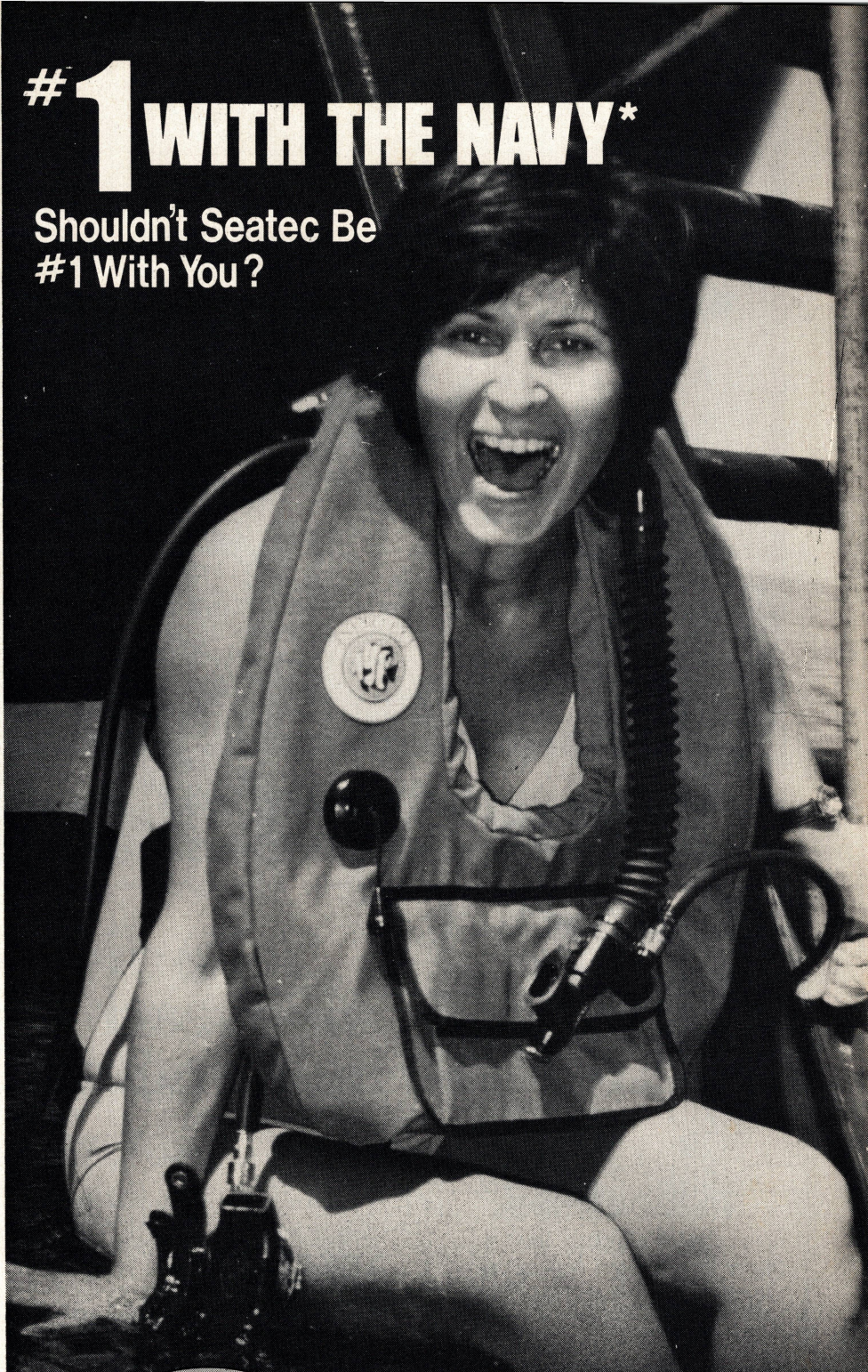
The Mark 30 is available with a Nikonos connector (specify type) for \$298.50, and with an EO connector for \$309.50. For a specification sheet, write to: Subsea Products, 1006 West 15th Street, Riviera Beach, FL 33404. >

SUBSEA MARK 30 SPECIFICATIONS

SIZE	3.25 x 6 inches
WEIGHT	Two Pounds
POWER SUPPLY	Three alkaline or ni-cad C cells
NUMBER OF FLASHES	Up to 1000
RECYCLE TIME (fresh cells)	6.5 seconds
EXPOSURE (3 ft., ASA 64)	18
U/W BEAM ANGLE	60° diagonal
CONNECTOR	Nikonos or EO

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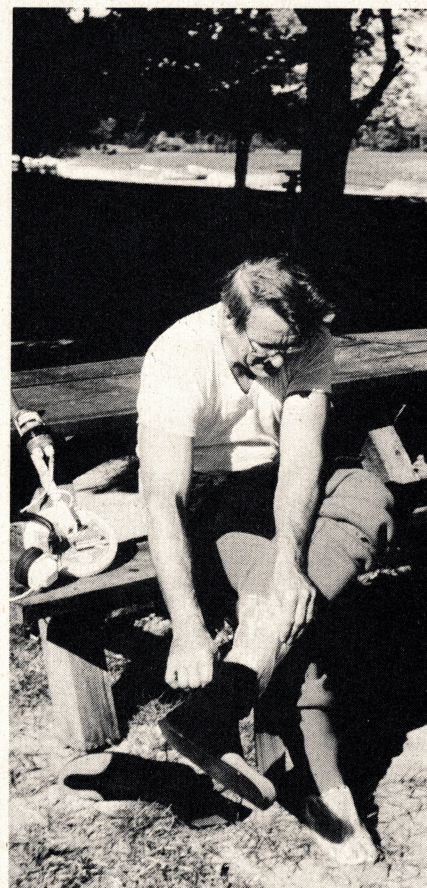
Bag Your Body

...for easy entry

TEXT AND PHOTOGRAPHY
BY RON PLOWE

Slipping gracefully into a wetsuit has always been a difficulty which seems to increase as the diver's age increases. I have tried using talcum powder sprinkled liberally over my arms and legs but found it turned into a yucky mess when I entered the water.

A better way has been discovered. By slipping plastic bags over each foot, I



have found that my foot slides easily through the wetsuit legs and, later, into the booties. Bags over the hands allow arms to slip neatly through the sleeves of the wetsuit jacket and into the mitts. I use plastic ice cube bags — the kind used at motels.

In addition to the ease of suit entry, there is increased comfort during the dive because the plastic bags greatly retard the exchange of water in and out of the suit.

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The fact is:

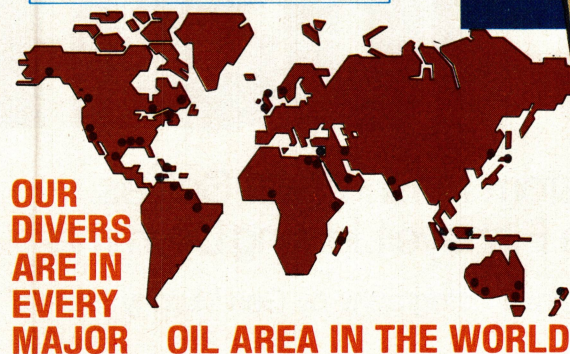
Oceaneering International designed Commercial Diving Center's training programs, moving over 40% of the graduates into key jobs under world-wide diving contracts. The others may opt to work for some 200 diving contractors who look upon C.D.C. as a producer of high-quality trainees ready to take on any job with any type of equipment.

The reason is:

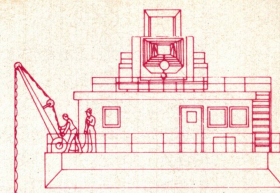
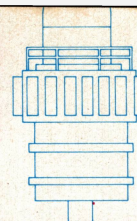
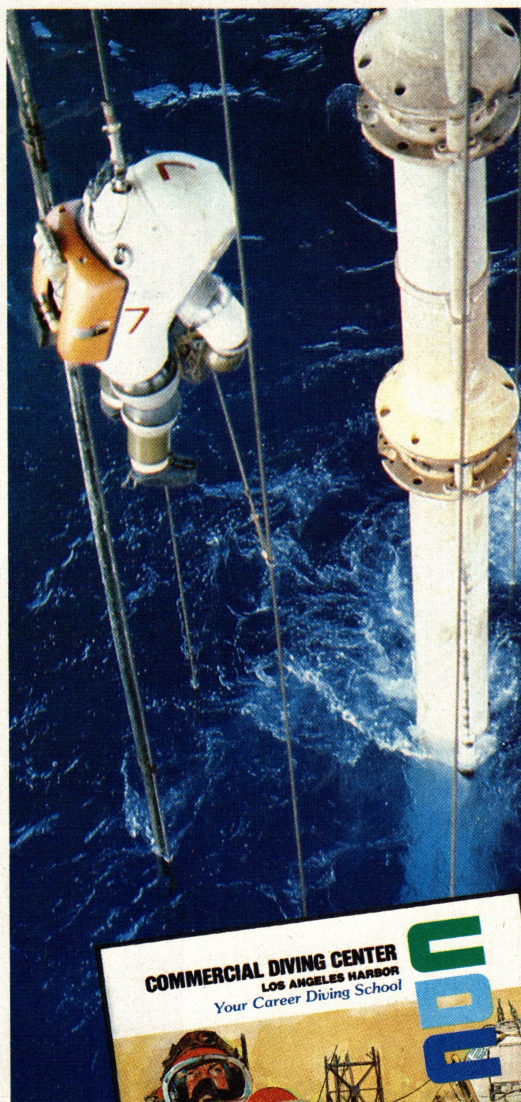
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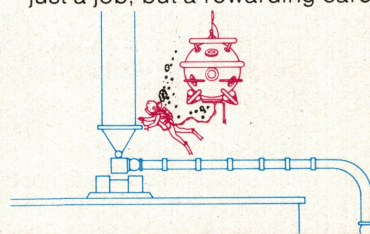
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Full 180 degree fisheye is perhaps one of the most exciting, and most challenging, lens formats for underwater photography. It is also one of the least utilized. The reason fisheye photography is such a rarity in the underwater world is the lack of a suitable flash to effectively illuminate a 180 degree field-of-view. As with other types of underwater photography, underwater flash is essential for colorful and pleasing pictures. The only underwater strobe which even comes close to illuminating a fisheye view is the Subsea 150, which lights approximately 150 degrees of the photo field.

But wait — there is new hope for fish-eye photo buffs. A custom underwater strobe maker by the name of Jack Drafaahl has recently developed a fisheye flash unit known as the Light Handle. This new unit effectively covers the full 180 degree field-of-view and also works well with extreme wide-angle lenses, close-up kits, and even macro extension tubes. Finally, the dive world has a fisheye flash.

BACKGROUND

Jack Drafaahl is a professional photographer who has devoted his entire life and energy to the world of cameras, lenses and lighting. A graduate of Brooks Institute of Photography in Santa Barbara, Jack makes his primary living from teaching college photography courses formerly in California and now in Oregon. In addition, Jack and his wife, Sue, operate a small business called Kritter Labs which is engaged in audiovisual show production, special effects color slide production, freelance photography, and stock photo sales. Jack is also a compulsive inventor who spends most weekends and evenings in his private laboratory, tinkering with new photographic equipment designs and electronic flash circuitry. He is sort of a modern day Thomas Edison in the world of underwater flash design.

BASIC DESIGN

The Light Handle is Drafaahl's most recent development, and one for which he has just received a U.S. design patent. The unit is primarily a double electronic flash in the configuration of a solid bracket which can be fitted to the Nikonos camera. Two separate flash units have been fitted into cylindrical tubes and fitted to a camera baseplate. The flash reflectors can be rotated to three different positions, thus providing a choice of flash angle coverage ranging from 90 to 110 to 180 degrees. For added versatility, the left-hand flash cylinder is detachable from the Light Handle baseplate. Two small stainless steel latches can be quickly unsnapped, and the tube removed for use as a remote slave flash unit.

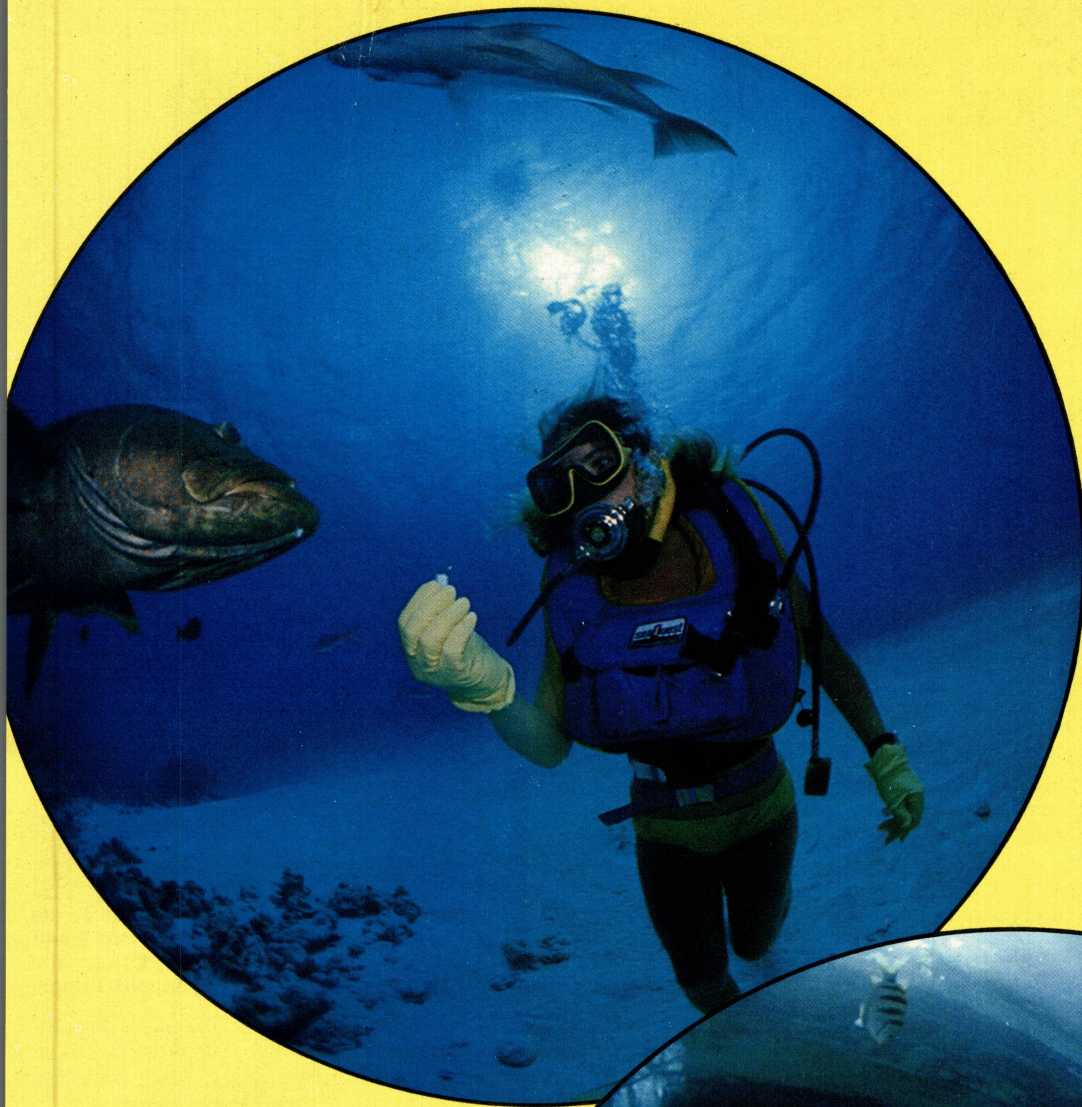
It is rather interesting to learn how Dra-



Fisheye Flash

Custom Flashmaker Solves
The Fisheye Lighting Dilemma

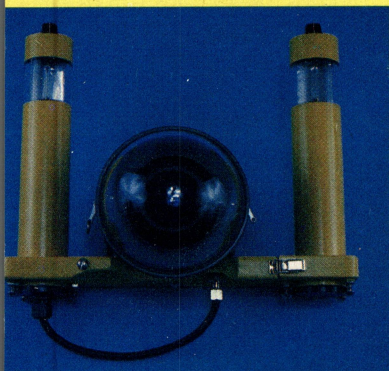
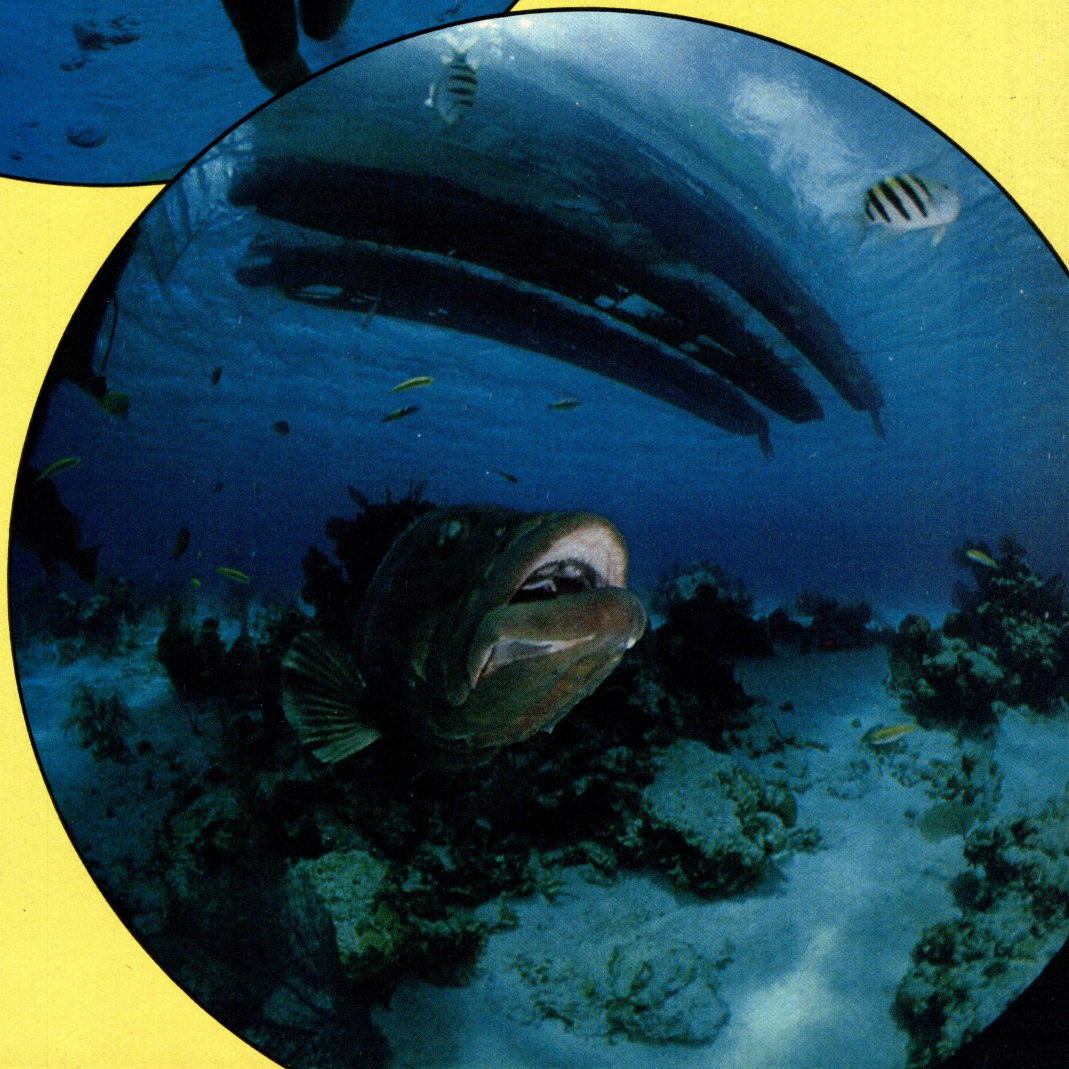
Text and Photography by Geri Murphy



Opposite page, the Light Handle electronic flash provides a new dimension to fisheye photos (brilliant colors, as shown by this globe).

Left, the Light Handle projects even illumination for the entire 180° field-of-view, for equidistant subjects.

Below, illumination from the Light Handle balances well with ambient light, thus providing excellent flash fill photos.



The Light Handle is a custom built electronic flash unit utilizing a unique patented design. The flash reflectors can be rotated to cover three different angles (left-hand flash is detachable).

fahl solved the fisheye flash problem. Using straight flashtubes, he has incorporated extreme wide-angle flash reflectors of his own design. The two flash reflectors are positioned in the Light Handle to point outward on a 45 degree angle from the axis of the lens. The end result is a full 180 degree coverage with a minimal half stop fall-off on the outer edges of the picture. Since the two flash units are solidly mounted on the camera baseplate, the angle of coverage is remarkably accurate and even — the secret of Drafaahl's success.

CONSTRUCTION

Drafaahl is not a large scale manufacturer but rather a hand craftsman. His "factory" is a home workshop. The Light Handles are custom made by hand — one at a time. Drafaahl takes a great deal of personal pride in the building and testing of each unit.

The two electronic flash packages are encased in one-quarter inch thick plexiglass tubing two inches in diameter. The end caps for these are made of one-half inch thick plexiglass sheeting. Drafaahl has tested these units to 165 feet.

The baseplate of the Light Handle is constructed of three-quarter inch thick plexiglass. It has been designed and drilled to fit a variety of Nikonos models including the II, III and even the new IV. A special slot in the rear of the baseplate allows for the use of the Nikonos 15 mm viewfinder. The front of the baseplate is designed to accept extension tubes and wire framers, as well as the special Nikonos Close-Up Kit.

The strobes contained in the Light Handle unit are miniaturized electronic flash packages that have been specially designed and built by Drafaahl himself. Using stock parts, Drafaahl constructed tiny but powerful 50 watt-second strobes which operate on four AA alkaline batteries. The entire strobe package can be easily removed from the plexiglass tube in case of flooding or leakage. A quick freshwater rinse and blow dry with a hair dryer is all that is needed for emergency first aid.

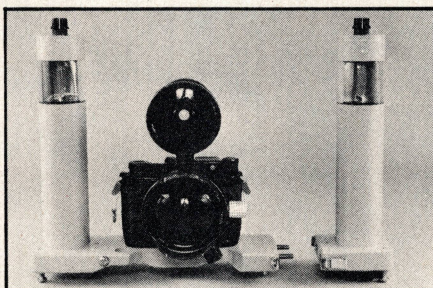
Each electronic flash unit is equipped with a manual on/off switch which can be operated by an external control. In addition to the manual switch, these units incorporate a clever energy saver mercury switch that automatically shuts off the power when the unit is on its back with the lens pointing straight up. The unit comes with a flash connector for the Nikonos of your choice. The Light Handle is available in a variety of different colors.

PERFORMANCE

The Light Handle puts out an average of 140 flashes per set of fresh batteries. You may be able to squeak out even a

few extra flashes by utilizing those ingenious power saver switches — hold the unit with the lens pointing up when it is not in use. Recycle time with the first roll of film and fresh batteries is a brisk three seconds — the recycle time gradually lengthens as battery energy is used. By the fourth roll, the Light Handle is recycling in seven to ten seconds.

The power output of the Light Handle is relatively low when compared to other giant wide-angle flash units. This is because the unit uses miniaturized electronic circuitry and replaceable AA batteries. At a distance of three feet under-



The left-hand flash tower of the Light Handle can be hand held or used as a remote slave strobe for accessory lighting.

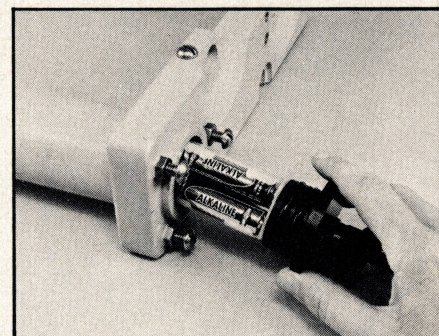
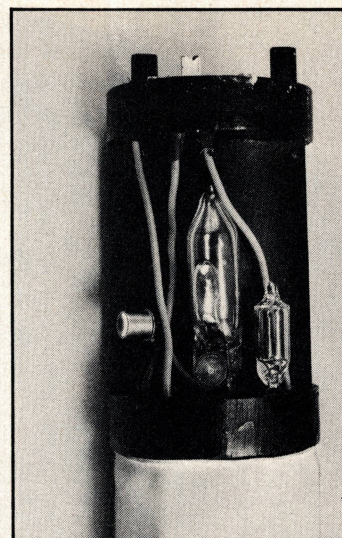
water, the flash output is somewhere between f2.8 and f4 when the flash reflectors are positioned at 180 degree coverage. However, most fisheye work is done extremely close, ranging from one to two feet. At these close distances, the Light Handle will put out enough power for an f5.6 to an f8 aperture setting using ASA 64 film. Fortunately, the low power output of the Light Handle makes it ideally compatible with ambient light conditions and the end result is a lovely flash fill effect.

SKIN DIVER also found that the Light Handle is not limited to fisheye use. It works remarkably well with wide-angle lenses such as the Nikonos 15mm and the Seacor 21mm, or the Sea & Sea 20 mm lens. The flash reflectors are rotated inward one notch for straight ahead alignment, producing a 110 degree angle of coverage. The overlapping effect of the twin strobes also produces a higher flash output for optimum wide-angle aperture settings.

The Light Handle can also be used for macro work by simply rotating the two reflectors one more notch so they point inward, thus directing their full concentration of light on the framer area. The average aperture setting for macro photography is f16.

OPERATIONAL HINTS

While the Light Handle is a rugged and fairly durable device it does require a certain degree of care and maintenance to avoid any potential problems with leakage. Because of its rigid construction (between baseplate and upright cylinders) the flash unit certainly deserves



Upper, components of the flash include the slave sensor (left), mercury switch (center) and ready light (right). Lower, the battery tubes are sealed by double O-rings.

its own separate carrying case with sufficient foam padding to prevent any stress on the baseplate joints. Also, batteries should be removed during storage.

The two bottom caps on the plexiglass cylinders should be removed from the Light Handle when traveling. This will help avoid any internal pressure build-up within the plexiglass tubes owing to altitude changes (i.e.: Denver to Nassau). Plexiglass tends to crack from internal stress situations. The double O-ring bottom caps should be heavily greased on a fairly frequent basis.

CONCLUSION

The Light Handle is indeed an ingenious device for fisheye illumination underwater. It covers the full fisheye field better than any other device available, and it can be used easily. It sells for \$495 — a fair price considering the fact that each one is handmade. The Light Handle must be ordered in advance as each one is built to the photographer's personal requirements (i.e.: Nikonos connectors, color, etc.) allow four to six weeks delivery.

Should you desire more information or would like to order a Light Handle, contact Jack Drafaahl: Kritter Labs, P.O. Box 88, Hillsboro, Oregon 97123. 🐸

Technifacts

BY E.R. CROSS



Technifacts for February, 1981 was a brief overview of commercial diving with an outlook for potential employment of divers graduating from commercial diver training institutions. The information in that column was prepared in mid-1980. It was based on information from late 1979 and early 1980 publications. A letter from Larry Cushman, president of The Ocean Corporation, appeared in Technifacts last month. In it Mr. Cushman set forth some differences of opinion with respect to the information I presented in February.

Technifacts for this month is an effort to update commercial oil field diving information and is, in part, a reply to Cushman's earlier letter. The discrepancy between my information and Cushman's is owing partially to the time factor. Also, the offshore oil industry is cyclical. First there is a need for oil, lots of oil. A lot of drill rigs and production platforms are built and a lot of oil is found and recovered. Then there is too much oil, resulting in fewer rigs of all kinds working. Demand for the services of divers varies in offshore oil work in the same cyclical manner.

The mid-to-late 1970's were probably the low points in the offshore cycle. Diving in 1976 and 1977 suffered from the impact of increased government intervention that greatly affected the cost effectiveness of divers. Early 1980 was the beginning of the upward trend for the offshore oil industry and for oil field diving.

During the lean diving years many smaller dive companies found themselves in financial difficulties and had to sell their businesses to larger companies. As a result, diver employees of the larger companies increased dramatically while the overall number of divers employed throughout the industry did not increase at the same rate. A considerable number of the smaller dive companies absorbed were engaged in non-oil field construction, salvage and research; all areas of marine work affected by lack of funding for the past several years.

It is interesting to note that the smaller

companies which survived are now experiencing tremendous growth and expansion in areas of work and in number of divers employed. An example of this is American Divers, Inc. Formed in the early 1970's, it is based in Honolulu, Hawaii. In 1979 the company's diver payroll was down to four divers, all on jobs in Hawaii. In 1980 diver employment was at eight and in 1981 at 16. According to Pat Wolter, president of American Divers, the secret of survival and expansion for small dive service companies is in specialization. American Divers has specialized in pipeline work; large diameter concrete outfalls and smaller oil field pipelines and risers. They are currently working two pipeline jobs in Puerto Rico, two in California, and two in Hawaii, and have a long-term oil company pipeline-tanker-mooring inspection, maintenance and repair contract in Hawaiian waters.

A review of 1981 oil industry literature dealing with offshore work reveals a consensus of offshore oil companies regarding the dive industry that indicates the following:

1. The offshore oil field dive industry is extremely competitive at both the company and the diver levels. This, coupled with the inherent risk to human life and extreme difficulty in accomplishing many of the tasks, has sparked technological developments that permit reasonably safe underwater work at depths of 1200 feet with some companies reaching for 2000 feet.

2. The offshore dive industry is dominated by ten major companies accounting for about 84 percent of all diver employees.

3. Dive companies are active in support of all phases of offshore oil; exploration, construction, maintenance, inspection, repair and transportation by both tanker and pipeline systems. The greatest demand for divers at present is in the areas of inspection and maintenance work on offshore structures.

4. Demand for divers qualified in visual and NDT (non destructive testing) inspection and in repair will probably increase significantly owing to worldwide

government regulations related to offshore structure safety.

5. Projected activities indicate an increase in diver demand in areas of drilling and development phases of offshore oil when the large number of new drill rigs, mostly semi-submersibles, are delivered in mid-1982.

6. There are definite trends appearing in offshore work that will eventually affect diver employment. The offshore oil companies are not only accepting, but actively encouraging the development of alternative methods of accomplishing underwater tasks. These include one atmosphere dive equipment (JIM's, SAM's, etc.), remote controlled or operated vehicles (RCV's or ROV's), the ARMS bell, and the development of other, newer, more sophisticated manned and unmanned dive systems. One exhibitor at a recent ADC conference stated, "The mix of divers and ROV's will surely swing toward ROV's since human capabilities will not change but ROV's will improve."

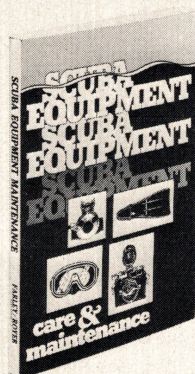
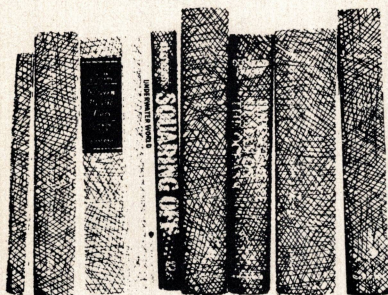
7. Within the industry there is strong incentive for developing equipment and techniques for offshore oil work. It has been estimated that 40 to 55 percent of the world's remaining oil and gas reserves will be found in offshore areas. The industry now has the technology to work the continental shelf areas at almost any depth in some of the toughest environments in the world.

8. Finally, for the first time since 1930, the oil industry in the United States is free from government regulations and the price of oil, the only product the oil companies have to offer, is reaching its true value in the economy of the country.

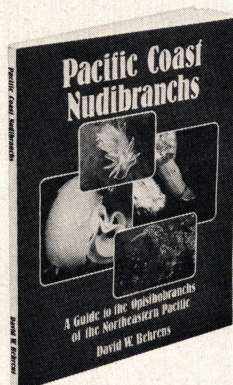
It is expected that offshore oil work will pick up in all areas. However, estimates are that the greatest activity will occur in the U.S. Gulf of Mexico, in South East Asia, Latin America (Mexico, Venezuela, Brazil, and Chile mainly), and West Africa. Offshore work on the U.S. West Coast-Alaska is also expected to increase.

The North Sea area will probably slow
(Continued on Page 92)

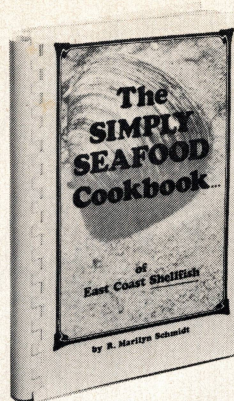
New Books



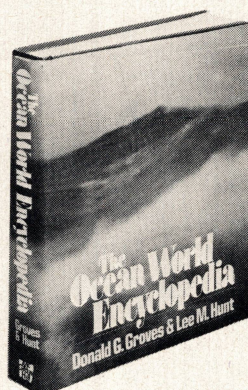
1 Scuba Equipment: Care and Maintenance — A complete guide to the care, storage, repair and transport of dive equipment from fins to camera gear. Clearly illustrated and written for the sport diver, this work is a valuable reference. \$7.95. From Marcor Pub., Box 1072, Channel Is. Harbor, Port Hueneme, CA 93041.



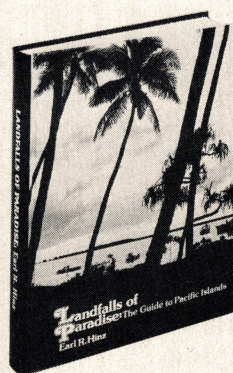
2 Pacific Coast Nudibranchs — The opisthobranch mollusks of the north-eastern Pacific are clearly described and luxuriously illustrated with color photographs and indexed by common and scientific names. \$24.95 (hard cover), \$14.95 (soft cover). From Sea Challengers, 1851 Don Ave., Los Osos, California 93402.



3 Simply Seafood Cookbook of East Coast Shellfish — Divided into sections by animal group (crabs, clams, etc.), each includes a general description of the common species of this group found in the waters of the eastern U.S. and how to buy & prepare them. \$7.95. From Barnegat Light Press, Box 305, Barnegat Light, NJ.



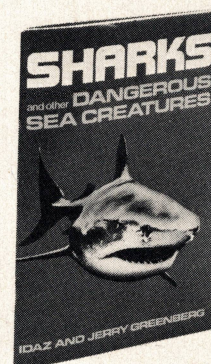
4 Ocean World Encyclopedia — Written for the non-specialist, this excellent work covers subjects from biological and physical oceanography to famous oceanographers. Many related subjects are included. Many illustrations. By Donald Groves & Lee Hunt. \$29.95. From McGraw-Hill Book Company, Inc.



5 Landfalls of Paradise: The Guide to Pacific Islands — Containing many maps and photographs, this guide divides the island groups into four culture zones. It is a storehouse of information on the culture and navigation of these areas. \$29.95. From Western Marine Enterprises, Inc., Box Q, Ventura, California 93002.



6 Dive Cayman — This guide begins with a background on the structure and life of a coral reef. Following this, the fabulous dive sites of Grand Cayman, Little Cayman and Cayman Brac are described. Many U/W photographs are included. \$10. From Undersea Photo Supply of Cayman, Box 1551, Grand Cayman, BWI.



7 Sharks and Other Dangerous Sea Creatures — This summary begins with a discussion of dangerous sharks and continues with coverage of dangerous marine animals from stinging corals to microorganisms. Excellent color photographs. \$4.95. From Seahawk Press, 6840 South West 92 St., Miami, FL 33156.



8 How to Mount Fish: For Profit or Fun — The step-by-step preparation and mounting of fish using the methods of leading taxidermists is carefully explained and illustrated by photographs. Techniques from skinning and filling to mounting are explored. \$19.95. From Archie Phillips' Taxidermy Studio, 200 52nd St., Fairfield, AL.

Scuba Quiz

Category: Dive Table Exceptions

By Dennis Graver

Recreational divers are to dive conservatively, following specific procedures to avoid decompression sickness. At times, however, certain situations require a diver to deviate from the standard practices. Are you familiar with the exceptions and special rules for the dive tables? See how you would handle the following circumstances, then compare your answers with those on the following page.

NOTE: Select all correct answers: Several questions have more than one response.

1. When the surface interval between two dives is less than ten minutes:

- ☐ A. The two dives should be considered as a single dive
- ☐ B. The average depth of the two dives should be used for the dive schedule
- ☐ C. The maximum depth of the two dives should be used for the dive schedule
- ☐ D. The bottom times of the dives should be added together, but the surface interval time should not be included
- ☐ E. The residual nitrogen time for the second dive is the actual bottom time of the first dive

2. After a dive to 60 feet for 30 minutes, you plan to return to the same depth following a surface interval of 30 minutes. Your residual nitrogen time for the second dive is:

- ☐ A. 24 minutes
- ☐ B. 30 minutes
- ☐ C. 36 minutes
- ☐ D. Added to the bottom time of the first dive
- ☐ E. Added to the bottom time of the second dive

3. A diver struggles for ten minutes to free a fouled anchor at a depth of 71 feet in 50°F water. The dive schedule for the dive should be:

- ☐ A. 70/10
- ☐ B. 80/10
- ☐ C. 90/10
- ☐ D. 90/12
- ☐ E. None of the above

4. A diver makes an unrequired decompression stop at ten feet as a safety precaution. For figuring repetitive dives, this safety stop time should be:

- ☐ A. Ignored
- ☐ B. Included in the surface interval time
- ☐ C. Added to the bottom time of the dive
- ☐ D. Grounds to terminate diving activity
- ☐ E. Deducted from the residual nitrogen time of the next dive

5. A diver exits the water for a new tank of air, re-enters the water, and decompresses at 40 feet, 30 feet, 20 feet, and 10 feet. This procedure:

- ☐ A. Is only necessary during planned decompression dives
- ☐ B. Requires a surface interval of five minutes or less
- ☐ C. Is a standard safety procedure for all dives beyond 130 feet
- ☐ D. Should be used if needed decompression is omitted during ascent
- ☐ E. Should not be required by recreational divers

6. If a diver surfaces at a rate greater than 60 feet per minute, he/she is supposed to:

- ☐ A. Immediately return to the bottom and resurface at the correct rate of ascent
- ☐ B. Stop at ten feet for the difference in time between the normal rate of ascent and the actual ascent time
- ☐ C. Have no concern unless symptoms of decompression sickness occur
- ☐ D. Add the difference in time between the normal ascent rate and the actual ascent rate to the bottom time
- ☐ E. Carry out the procedure for omitted decompression

7. A delay during an ascent makes it necessary for a diver to:

- ☐ A. Increase the total bottom time of the dive by the difference between the actual ascent rate and the normal rate of ascent
- ☐ B. Carry out the procedure for omitted decompression
- ☐ C. Finish the ascent at a faster rate to compensate for the delay
- ☐ D. Count the time of ascent until the delay plus the delay time as bottom time
- ☐ E. Make a three minute safety stop at ten feet

8. During a planned no-decompression dive, the no-decompression limits are exceeded and no dive tables are available. The divers in this situation should:

- ☐ A. Be alert for symptoms of decompression sickness after surfacing from the dive
- ☐ B. Decompress for three minutes at a depth of ten feet
- ☐ C. Decompress at ten feet for the duration of their air supplies
- ☐ D. Have contingency information available on underwater slates
- ☐ E. Have dive tables with them for underwater calculations

Scuba Quiz

Answers: Dive Table Exceptions

1. A, C, D, E. When the surface interval between two dives is less than ten minutes, the bottom times of the dives are to be added together and the deepest depth reached on either dive should be used to determine the dive schedule. The same schedule can also be obtained by using the actual bottom of the first dive as the residual nitrogen time for the second dive, again using the deepest depth attained.

2. B, E. When a repetitive dive is to the same or greater depth than a previous dive, the residual nitrogen time from the dive table may be greater than the actual bottom time of the previous dive. In this event, you may use the actual bottom time of the previous dive as the residual nitrogen time rather than the residual time figure from the dive table. While this exception is permissible because residual time obviously should not be able to exceed actual bottom time, many divers choose to ignore it and use the time difference as a safety factor.

3. D. When a number is exceeded in the tables, the next larger number is to be used. A dive to 71 feet is considered an 80 foot dive. Remember though, cold and strenuous dives require use of the next greater time and depth. In this instance, the next greater depth is 90 feet and the next greater time is 12 minutes. This is to allow for increased nitrogen absorption from exercise and greater retention of nitrogen in body tissues owing to the cold.

4. C. The safety stop procedure is one recommended to recreational divers by noted physicians and physiologists. Bubble detection studies have shown a marked decrease in bubble formation with only a two to three minute delay at ten feet during ascents. Adding this unrequired decompression time to your bottom time is an added safety factor that still allows continued use of the standard dive tables for repetitive diving. Also see answer number seven.

5. B, D, E. If a diver surfaces without adequate decompression and has no symptoms of the bends, he or she has five minutes to determine the required decompression, get back into the water, and decompress at 40 feet for $\frac{1}{4}$ the 10 foot stop time, at 30 feet for $\frac{1}{3}$ the 10 foot stop time, at 20 feet for $\frac{1}{2}$ the 10 foot stop time, and at 10 feet for $1\frac{1}{2}$ times the 10 foot stop time. Since recreational dives are planned for no-decompression, this procedure should not be required for pleasure dives.

6. B. For a rapid ascent in a no-decompression situation where the total bottom time is within ten minutes of the no-decompression limit, stop at 10 feet for the difference in time between the normal rate of ascent and the actual ascent time. For instance, if you ascended at three times the normal rate from 120 feet, you would be required to stop at 10 feet for 80 seconds. (Normal = 120 seconds minus Actual = 40 seconds. Difference = 80 seconds.) Because recreational divers typically exceed the proper ascent rate, this is another good reason for a safety stop at ten feet.

7. A. For a delay in ascent from a depth greater than 50 feet, increase the total bottom time by the difference between the actual ascent time and the normal rate of ascent. If you stop for one minute during an ascent, add that minute to the bottom time of the dive. The tables are based upon ascents made directly to the surface and delays in ascent should be avoided. A safety stop is a good procedure on all dives below 50 feet, so E is also an acceptable answer.

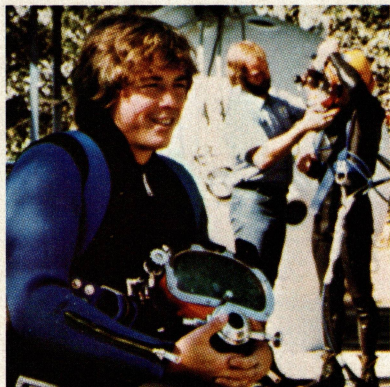
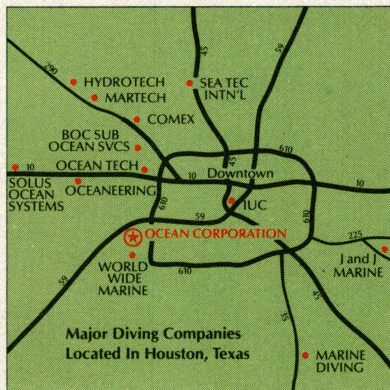
8. A, C, D. Divers should always be alert for symptoms of decompression sickness after a dive, but even more so when the limits have been exceeded. If you have no way of knowing the amount of decompression required, play it safe by decompressing as long as possible. Dive table calculations are not to be made underwater. Contingency information should be available on an underwater slate and recorded prior to the dive. This information should include the planned depth and no-decompression limit time, the decompression required for the next greater time, and similar information for the next two greater depths. Planned dives are safer dives.

How well did you do? Nearly all of the situations depicted in the questions can easily occur in recreational diving. Were you knowledgeable enough to handle them properly? Are you better prepared now? Do you feel that some type of continuing education program in diving might benefit you by increasing your awareness? These special procedures and exceptions are somewhat complex and difficult to recall without periodic review. Perhaps the best procedure of all is to dive shallowly and conservatively, following well-made plans. Preventing problems in diving is much easier than coping with them.

Why Houston?

BECAUSE

The Ocean Corporation is located in Houston and more commercial divers are hired in Houston than in any other place in the world. Twelve diving companies are located in Houston including three of the four largest in the U.S. Many others are located in the nearby New Orleans area. The demand for divers is so great in Houston that large locally based diving companies like Ocean Systems, Hydrotech Systems, Martech International and Sea Tech International have hired many of our students for part-time work while they were attending school. Over 90% of our recent graduates went to work for these and other local diving companies when they completed our program. Houston is the place where the action is...the commercial diving, offshore construction and oil industry capital of the world.



BECAUSE

The Ocean Corporation is a commercial diving company, not just a school. Our facilities, equipment and training aids are the best, and our diving systems are as up-to-date as possible... because much of the equipment is used by our diving operations division to perform actual diving contracts in the field. Ocean Corporation has successfully completed many underwater jobs for various industrial clients over the years... including specialized underwater inspections, maintenance and repair work. For example, we did the world's first commercial underwater repair job in a nuclear power plant. And most of our divers have been graduates of our own school.

BECAUSE

The Ocean Corporation is a convenient and exciting place to go to school. Houston is one of the fastest-growing and most dynamic cities anywhere. It is a city of expansion, energy and youth (the average resident's age is in the mid-20's). Houston offers every conceivable kind of entertainment, from sports events, ultra-modern discos and open-air theater to rough-house local rodeos, chili cook-offs and the new Texas-size

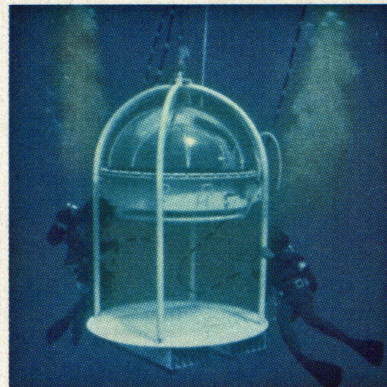


country-western dance clubs. Reasonably priced adult and singles apartments are readily available within walking distance of the school, and fast-food to luxury restaurants are nearby. The semi-tropical climate is wonderful, the sport diving is great and the folks are friendly.

BECAUSE

The Ocean Corporation management and instructor staff have long-term experience in the international offshore oilfield diving business. Retired ex-military divers and sport scuba divers don't run the school...commercial divers do. For example, the President of The Ocean Corporation, Larry

Cushman, was Vice President and Europe/Africa Area Manager for Ocean Systems, Inc. for three years...with responsibility for all North Sea diving and underwater construction operations. He also worked six years as a manager for Oceaneering International, Inc., another of the world's largest commercial diving contractors. Ocean Corporation managers and instructors know today's diving business...first-hand, from recent experience.



The Ocean Corporation

5709 Glenmont • Houston, Texas 77081

If you are interested in becoming a commercial diver, please write and ask for our free information package on job opportunities, our school and our super city. If you'd rather call, make it collect and ask for Fred Tourtel (713) 661-0033.



School of
Commercial and
Industrial Diving

NAME	AGE		
STREET			
CITY	STATE	ZIP	
A/C	PHONE		

NEW ENGLAND'S FERTILE WATERS

Cold Water Creatures Make the Northwest Atlantic a Fascinating Fantasyland By Mary Cerullo

Diving off the shores of New England is a stimulating experience, once one has become accustomed to the numbing cold and diffuse light. The chill, oxygen-rich water supports vast quantities of plankton, the microscopic floating plants and animals that form the first link in an ocean food chain. Plankton filter out the sunlight and create a hazy twilight that helps to conceal animals living just below the surface. Visibility is often limited to a few meters. Part of the reward of diving in these waters is watching indistinct shadows slowly take recognizable form as they emerge from the dim background. Even a common crab or starfish, detected through a veil of drifting plankton, becomes a discovery. A diver needs a sturdy constitution and the patience to allow the environment to reveal itself gradually from out of the gray-green gloom.

Glacially-deposited mud, sand and rocks line the contours of the New England continental shelf. The animals have adopted the muted tones of their surroundings. Tans, grays and browns are as common here as in a board room of conservative executives. Brighter colors stand out defiantly against the pallid backdrop, attracting attention to their owners. These flamboyant displays often belong, curiously, to inedible organisms such as encrusting coralline algae, sponges and nudibranchs. At greater depths, even the boldest pinks and reds fade to black in the faint light.

Fish that live directly on the bottom are not streamlined, nor is speed one of their assets. They have other means of staying alive. The sea raven, for example, is a master of camouflage. Fleshy projections resembling tattered pieces of seaweed adorn its head and body. Lying on the rocky substrate, the sea raven looks like just another algae-covered rock. It may maintain this stone-like illusion for hours until some predator penetrates its disguise. The sea raven then inflates its belly with water. Suddenly rotund, the animal is too big for the predator to swallow, but also too unwieldy to swim. It paddles about feebly, unable to do much more than drift with the current until it deflates.



The voracious goosefish flags down prey with its built-in bait.



The fleshy projections which adorn the body of the sea raven resemble tattered pieces of seaweed and provide camouflage.

Near right, the northern starfish can feed on the horse mussel by prying open the valves of the mollusk. The gap need not be large as the starfish can slip its stomach inside the mussel to digest it.

Far right, the horse mussel reaches lengths of 15 centimeters. It attaches itself to the substrate by threads which are secreted from a gland on the mussel's foot. These threads make up the byssus.



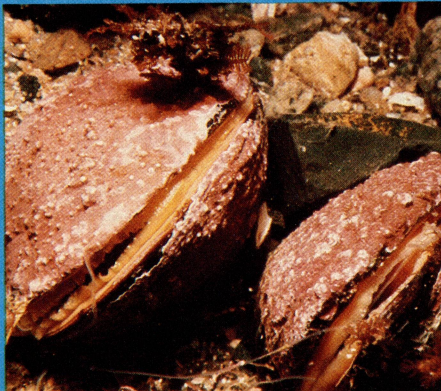
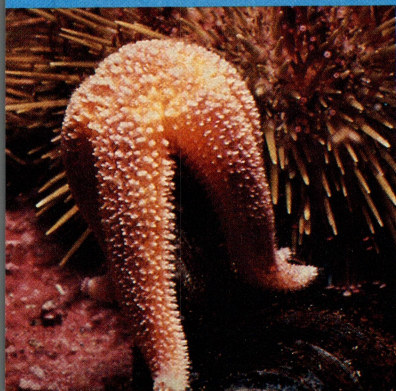
photos/Jeff Rotman



s skate was startled by diver's bright light.



The sea butterfly is a delicate, shell-less gastropod native to open ocean.



A large hermit crab clutches a smaller relative.

If disguise is the sea raven's best defense, deception is the goosefish's best offense. The voracious goosefish is mostly mouth, equipped with a set of toothy jaws that curve halfway round its head. Compressed against the ocean floor, it flags down passing fish by waving its built-in bait — a tantalizing piece of flesh that is a modification of its first dorsal spine. A would-be predator approaches. In an instant it is gulped and gone. Though normally a bottom dweller, the goosefish may sometimes feed at the surface where it snares resting birds by grabbing their feet and yanking them underwater. Although it has never been proven that this fish can swallow a bird the size of a goose, the origin of its name has been attributed to just such a feat. The fact that birds such as cormorants and herring gulls have been found inside the stomachs of goosefish lends some credence to the story.

Another bottom dweller, the winter flounder, is almost indistinguishable from its environment. Only two bulbous, close-set eyes betray its presence in the mud. The winter flounder is born looking and swimming like other fish, but within a few weeks its body begins an amazing transformation. The left eye migrates across the skull until it nestles against the right eye, and the fish then begins to swim on its side. The left half now faces downward, having lost not only its eye, but all its pigmentation as well. The flounder now lies flat on the ocean bottom or perches on its side fins, which had once been its top and bottom fins. As the rest of the flounder's body molds to the shape of its environment, only the mouth remains unchanged, though it now appears to open sideways into a tiny crooked smile. The winter flounder feeds on seaworms, shrimp, small crabs and mollusks.

Larger invertebrates such as the horse mussel are in no danger from the flounder's dainty mouth. The horse mussel, up to 15 centimeters long, is among the largest of the bivalves. It sits upright in the mud, pumping sea water through its siphons while anchored to the substrate by strong byssal threads. These are spun from a gland in the mussel's foot and harden on contact with sea water. This tangle of threads may shelter a community of brittle stars, baby sea urchins or other fragile creatures.

Even the massive horse mussel must yield to the determined embrace of the northern starfish. The tube feet of the latter, which operate like a hydraulic pump, can pull for hours to open a slit between the two halves of the mussel's shell. Then the starfish projects its stomach through its mouth and inside the mussel, where it digests the mollusk right inside its own shell, thus adding new meaning to the term dining out. Because of its prickly skin, the starfish does not have many

predators. Consequently, the bright red bloodstar, another New England starfish, can flaunt its presence with impunity.

The sea cucumber has the same five-point symmetry as its relative, the starfish, but has soft skin instead of spines. Sometimes when defending itself, the sea cucumber violently contracts its cylindrical body and hurls part of its internal organs at the persistent intruder. The startled attacker retreats while the sea cucumber calmly lumbers off on its tube feet. The lost organs will grow back in several weeks.

The salmon-gilled nudibranch is another soft, defenseless-looking creature

not possess a shell of its own but has to borrow one. Only its front claws are armored, so it must find an empty shell to protect its soft rear and flanks. It fixes its corkscrew-like rear appendage securely within the internal whorls of a borrowed shell. If there is a hint of danger, the crab retreats deep inside the shell.

When the hermit crab grows too large for its home, it begins to search for roomier quarters. It thoroughly scrutinizes each new shell, tapping it inside and out with its claws.

A shell is a valuable commodity worth fighting for in New England waters. Hiding places are at a premium on the grav-

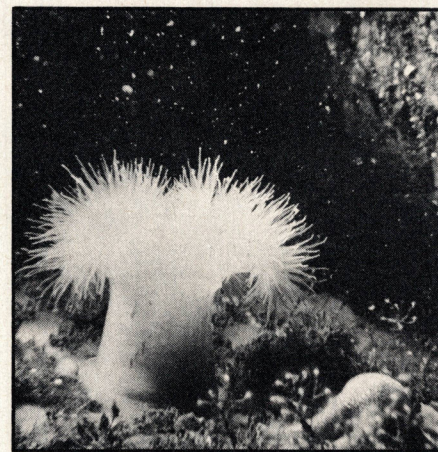
Right, when mating, one or more male horseshoe crabs will hitchhike on a female for a ride to the beach where the eggs are laid and fertilized. Lower, this anemone extends its tentacles to receive a meal of falling plankton. Its stinging cells paralyze prey.



that predators avoid. It is a mollusk without a shell that grows no longer than three centimeters. It derives its protection from a diet of sea anemones and hydroids whose stinging cells it ingests whole. The untriggered poison barbs are coiled inside the nudibranch's cerata, the gill-like projections on its back. If annoyed, the nudibranch forcefully empties its stored ammunition into the attacker.

While the nudibranch grazes on anemones and algae, its more aggressive cousin, the moon snail, hunts down other mollusks. The moon snail secures its prey with its fleshy foot and uses a combination of tools to penetrate the victim's shell. It drills a hole with its file-like tongue or radula in conjunction with a secretion of sulphuric acid. The northern moon snail is responsible for the tiny circular holes found in many empty mollusk shells.

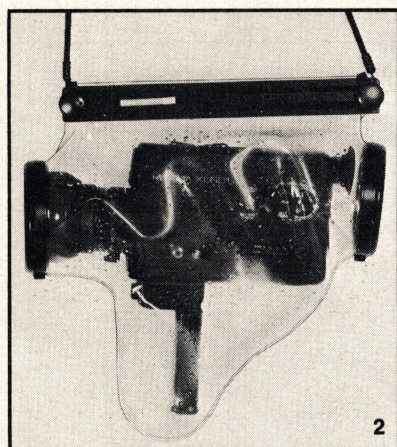
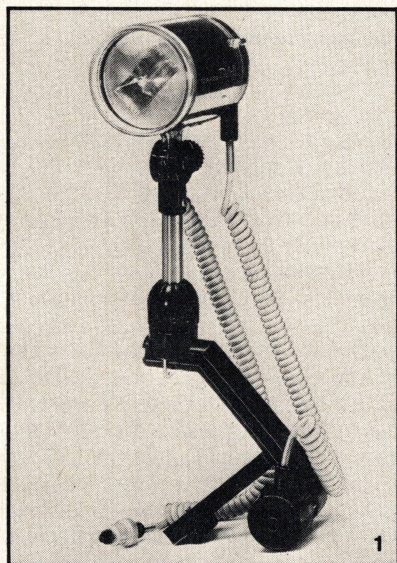
For those creatures that lack the sophisticated weaponry of stinging cells and sulphuric acid, armor works equally well. The lobster wears jointed plates of chitin augmented by a crushing claw and a tearing claw. If threatened, the lobster raises these claws aloft, prize-fighter style. The pincer claws of most other crustaceans are less developed and not as effective for defense. The decorator crab employs a clever defense strategy — it festoons its shell with anemones, seaweed, barnacles and other imaginative camouflage. The hermit crab does



elly continental shelf of the East Coast. Predictably, the species that can best adapt to their habitats are the ones that survive.

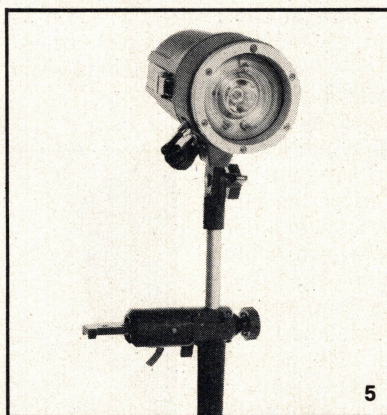
Although shelter may be in short supply in the Northwest Atlantic, food is not. The cold waters provide a movable feast. But the banquet is not without a price; one by one each diner finds itself the next item on the menu. The immutable law of nature decrees that eventually all organisms are added to the food chain, either by capture or by decay. It is worth a plunge into these waters to observe firsthand the elaborate adaptations that each species has evolved to delay the inevitable. 

Photo Gear



1 Automatic Exposure Strobe—Designed for use with the Nikonos III and IV cameras. The Toshiba TM-2 automatically controls its flash at depths to 198 feet. The strobe is powered by four AA cells. Automatic coverage on land ranges from 1.6 to 23 feet. \$299.95. From Elmo Mfg., 70 New Hyde Park Rd., New Hyde Park, NY.

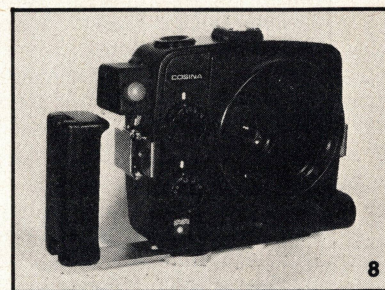
2 Flexible Housing—Made of a tough double-laminated, heat-welded PVC bag, this flexible underwater housing is depth rated to 30 feet. Complete with two glass lenses, the unit is closed by stainless steel rails. Starting at \$59.95, the EWA Space Suit is available from Pioneer & Co., 216 Haddon Ave., Westmont, NJ 08108.



3 SLR Housing—The Marine Capsule A is constructed of stainless steel. The housing is designed for the Canon A-1, AE-1 or AT-1 cameras equipped with autowinder. The system, including 52 mm close-up lens, adapters, O-ring and dome port, is \$2700. From Canon USA, Inc., 1 Canon Plaza, Lake Success, NY 11042.

4 Film Processing/Enlargement Package—This introductory offer includes six rolls of 36 exposure slide processing and enlargements; six 8x10", five 11x14" and five 16x20". The package is offered to readers with this ad for \$149.95, a 40% savings. From PhotoMagic, 720 NW 27th Avenue, Miami, Florida 33125.

5 Strobe Mount—The Quick Handle I provides one hand control when positioning strobes. A quick-release lever allows the unit to be removed for hand held lighting. The ball socket joint and 22 inch extension arm allow for infinite variations in lighting. \$99.95. From Ikelite, 3303 N. Illinois St., Indianapolis, IN 46208.



6 Underwater Lens—The Widelens 20 mm is depth rated to 200 feet. Apertures range from f2.8 to f16 and the minimum focus is .22 meter. The angle of coverage is 84°. The lens fits Nikonos cameras — even the IV-A in auto. Lens \$590, viewfinder \$58. From Sea & Sea USA, 439 Mola Ave., Ft. Pierce, Florida 33301.

7 Automatic Strobe—The SB-101 is designed to work in conjunction with the Nikonos IV-A camera in automatic exposure or manual modes. Operating on eight size AA cells, the strobe has two power settings and covers an U/W angle of 50°. \$565. From Nikon Inc., Dept. 25, 623 Stewart Ave., Garden City, NY 11530.

8 Housed Camera—Designed for depths up to 50 feet, the CX-Marine housing accommodates the CX-2 35 mm camera and CX-W auto winder. Camera's focal range is 0.9 meters to infinity. Automatic or manual apertures: f2.8 to f16. Camera, auto winder, housing: \$470. U.S. Distributor, Pelican Prods., 23763 Madison, Torrance, CA.

SDM INTERVIEWS

Wes and Connie Mueller

Pioneers in Underwater Cinematography

By Jack McKenney

As I watched Wes and Connie Mueller hand feeding lobster, fat grouper, a sleek barracuda, a lemon and a sand shark, two things poignantly stood out in my mind: 1.) This was some of the most incredible fish feeding photography I had ever seen, and 2.) It was an intriguing and significant part of diving and underwater photography history.

Not many people in this underwater fraternity, even those who have been in it for over 25 years, have ever heard of Wes and Connie Mueller. They were in and out of underwater photography before diving became popular in the early 50's. But, a couple of years ago I met them at a film festival at the Norine Rouse Scuba Club in West Palm Beach. After the show Norine introduced us and a fast friendship, based on mutual interest and respect, soon developed. We corresponded for a year and on my next visit to Florida, Bernie Campoli and I went to the Mueller's home to interview them for SKIN DIVER Magazine.

The Muellers can be described as pioneers in the true sense of the word. When they began filming and taking pictures underwater back in 1934 there were no ready-made U/W camera housings or cameras. There was no literature describing the physics of light underwater as it applied to photography and there was no information on how to take underwater pictures. However, there was literature available that told of the dangers in tropical waters, of the terrifying sharks and barracudas that would likely eat them as soon as they ventured beneath the surface. But they were undaunted; they had read the works of William Beebe and had attended his lectures and decided that what they wanted to do together in life was to take pictures underwater. That was a pretty ambitious undertaking for two greenhorns, newly married, who didn't even know how to dive.

SDM: The obvious number one question — what inspired you to go underwater?

WES: William Beebe the scientist and explorer. We had read his books and attended some of his lectures.

CONNIE: And in one of his books he stated that he thought some fish could be tamed in the open sea, and Wes said that he'd love to find out if this was true.

SDM: What year was that?

CONNIE: It was in 1934 and we worked at it until around 1947.

WES: We were married in 1933, and it was the following year that we made our first trip down to the Bahamas on our anniversary to test out a tank (camera housing) I had made.

SDM: What were your professions at the time?

CONNIE: I was a school teacher and Wes was an engineer.

WES: The first three years we were married we lived on board a boat up in Englewood, NJ because we liked the water so much. But you know, after three years of ice and snow, living in subways and automobiles, and commuting 30 miles back and forth to work each day, and only seeing each other at night, we said "What are we doing living like this," so we put everything

we owned on our boat, the *Luray*, and headed south. We had bought the *Luray* from Sidney Grant, the actor.

CONNIE: Our primary interest was in working together and since we moved down here permanently in 1937 we've never been apart! We've been together 24 hours a day.

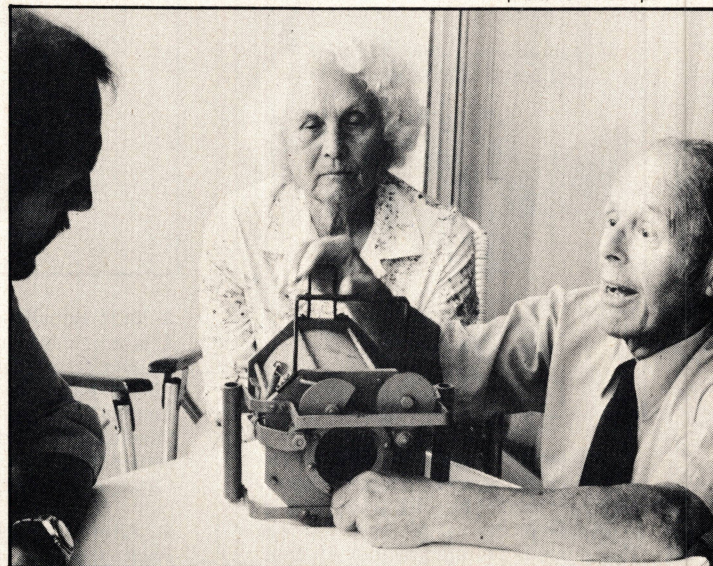
SDM: Really? Never any fights, or arguments?

CONNIE: We don't always think alike, but we never fight. We just have discussions.

SDM: When you moved down in 1937, was it to the Bahamas?

WES: No, we moved to Eau Gallie near Melbourne and we made it our base because it had such a perfect harbor. We started working in the Keys. After the first year we took our reels of film up to New York, to the Museum of Natural History, and projected them onto the wall. We asked the different specialists what the animals and fish were. And when Will Beebe saw our pictures he said we were doing all right, but the water in the Bahamas was much clearer, so we should go there to work.

photo/Bernie Campoli



Connie Mueller and Jack McKenney listen intently as Wes Mueller explains the operation of an underwater camera housing he invented over 40 years ago for use in the Bahamas and Florida Keys.

CONNIE: After our first year of filming in the Keys I'd send out penny postcards — you could buy them for a penny in those days — to different schools and institutions asking if they would be interested in a lecture on the undersea. We had to get money somehow, and we got our first request from a Catholic school in New York, so up we went. I'll never forget it because we talked about everything.

WES: Our first film was bad. The water was murky and you could barely see anything. We'd talk the audience into believ-

ing that they were seeing a beautiful fish on the screen and everybody thought they saw it.

CONNIE: They were horrible pictures, but it was a beginning.

SDM: Tell me a little bit about your equipment. What cameras did you use?

WES: When we started we simply went into a photo store in Newark, NJ and said to the proprietor, "We know practically nothing about photography, but we want you to outfit us for making underwater moving pictures and give us some printed instructions for using the equipment."

SDM: Just like that?

WES: It was just as simple as that. Originally we had one little 16 mm movie camera and before we left the Keys I had a foundry make me a bronze box for a second one. They were Bell & Howell cameras; one held 50 feet of film and the other 100 feet. I finished the tank (camera housing) and we were able to shoot close-up shots as well as wide-angle. And we used a Leica camera for stills.

SDM: What sort of waterproof glands (gaskets) did you design for the housing?

WES: I used valve bonnets that were taken out of water valves. I'd simply drill a hole in the housing, screw in the bonnet and as you can see I have controls for aperture, film wind, shutter release and focus.

SDM: How often would you have to repack the valve bonnets?

WES: I never repacked them; I used the original packing glands all that time.

SDM: For almost 13 years?

WES: Yes.

SDM: What about your dive equipment?

CONNIE: When we started just about everyone told us that we were going to be eaten alive by the rays, sharks and the barracudas.

WES: Oh, everything. Even the swordfish were going to run us

through, cut us up, and the sharks would eat what was left.

CONNIE: So we wore denim overalls and denim jackets. And I sewed lead into the sleeves, so they wouldn't ride up in the current. We put anchor chain around our waist and also around our ankles to hold us in the currents. And we had big rubber boots. The boots would fill with water, but that didn't matter, and of course we had the helmet.

WES: When we first started we really didn't know what to expect from sharks, barracudas and moray eels, so I fashioned makeshift armor-plated diving outfits from strips of metal. But, they pinched us so badly that after continuously snipping away the uncomfortable corners with cutters, to the point where the suits became comfortable, there wasn't much armor left. And by this time we had discovered that the so-called monsters of the deep were so alarmed by the sight of us that it was hard to get them into camera range in the first place. We found that the best way to entice them within shooting distance was to feed them conch. And by working one area for months at a time the fish soon became used to us and got to be our pets.

SDM: Any interesting fish stories?

WES: Because we worked one particular cove or reef for so long, the animals would become very tame. We were a little careful about the lemon sharks who would come in expecting to be fed, and the barracuda was worth being cautious of, too. But we fed them all. We even had moray eels and lobsters come out of their holes to be fed. One night when we were on the shore we splashed a piece of conch just under the surface and our pet lobster came right up out of the water to take it from our hands.

CONNIE: Some pretty funny things happened at first; I remember one time Wes got below and discovered that he had a big horsefly in his helmet and had to sneeze. We learned that barracuda wouldn't hurt divers, but we were still leery about

photos/courtesy of Wes and Connie Mueller



Above, Wes and Connie Mueller ready to dive in the Bahamas, 1938. Right, the Muellers trained this sand shark (upper) and this lobster (lower) to take food from their hands. The Muellers began feeding and filming underwater creatures at a time when many people believed these animals (sharks, etc.) would eat them alive.



just swimming and bathing in the water after a day of diving. We were so afraid of getting eaten that we built a great big chicken wire cage that we would swim in. Well, that first day after the tidal change a barracuda ended up on the inside of the cage, so we soon abandoned that idea.

WES: That happened in the Florida Keys. The natives thought we were building a conch crawl and the next morning when we woke up we were surrounded by four boats asking what we were doing. We finally convinced them that we weren't after conch and that we were just trying to take pictures.

SDM: Most of your time was spent working in the Bahamas rather than the Florida Keys, wasn't it?

CONNIE: Yes. We spent the first year in the Keys and the following winter season lecturing, which brought in enough money to buy film. That was our biggest concern, getting enough money to buy film. We spent ten years going back and forth to the Bahamas. We'd spend about six months of each year on location there and the other six months lecturing and showing our films.

SDM: From out of what area in the Bahamas did you generally work?

WES: The Exumas mostly, down by Ships Channel. And, we were entirely on our own. One time we anchored between two islands for four months and didn't see anyone except two black boys who sailed in on their boat and then sailed out again. We waited out a number of hurricanes in that snug little harbor.

SDM: How long did your dives usually last?

WES: Six hours. We would go down at nine and come up at three.

SDM: You mean you would literally spend six hours underwater at a stretch every day?

WES: Connie would spend the whole time underwater and I'd come up for one short trip to re-gas the compressor.

SDM: Did you ever have anyone else helping you?

WES: We had a Bahamian fellow help us one day and we had a bunch of nurse sharks come in. He got so excited and jumped up and down so much in the boat that all the sharks left, so we couldn't get any pictures.

CONNIE: And he left with them. He said, "I wouldn't do that for anything." No, we worked alone.

SDM: Did you ever get cold?

WES: No, the temperature was always 82°F. We wore the denims because they protected us from poisonous coral.

CONNIE: We worked very hard. We would always be up before sunrise and we'd be taking pictures of birds at sunset. The first time we discovered hermit crabs we collected them. It was too late to take pictures that day, so we put them on the after deck of the boat and they kept us awake all night crawling around.

WES: Water was at a premium. We would save rain water which we caught in the

sail of the dinghy. We only had a 30 gallon tank on the boat for fresh drinking water, so we had to be very sparing with water especially when we were away from Nassau for months. We found that one time we broke out in a rash all over and we didn't know what in the world was wrong.

CONNIE: We thought we had the measles.

WES: We thought it was the measles and everything else. And then it rained and the rash went away within the hour. It was a saltwater rash. Then we got into the practice at the end of every dive of taking off our clothes and pouring a cup of water over our heads to rinse off. We'd use another cup of fresh water to run it through the outboard motor, and other than drinking it, that was our water consumption for the day. And in the morning Connie would say that I could . . .

CONNIE: . . . shave, take a bath and brush his teeth with one cup of water.

SDM: I notice that your underwater photography is rock steady, and that sometimes both of you are together in the film. It seems obvious that you used a tripod underwater.

CONNIE: Oh yes, everything was on a tripod. We didn't use the tripod as much as we did the unipod though.

WES: The unipod is one leg which screwed onto the bottom of the tank (camera housing) and then with your own two legs you become a tripod.

SDM: Did you ever have any close calls?

WES: The first time we went down in the Keys we had a safety rope on the camera, a safety rope around our waist and safety ropes on various tools. We had so many safety ropes we got all fouled up. Once, in the Bahamas, we were making a deep dive and we were using a sash cord for an ascending line. Connie was descending just ahead of me and while I was still on the ladder the surge pitched me off head first and backward to the bottom. Naturally I had dumped all my air. And this was also the first test with our new gas driven compressor, so I sat myself upright and waited for the air, but none came into the helmet. I had to go up quickly, but I couldn't find the ascending line.

SDM: And you had a chain around your waist, and chains around your ankles?

WES: Yes, that's why I couldn't swim up, but then I saw Connie's hose which was red. I could see that even with water in my eyes. I frantically climbed it, but the last thing I remember just three feet from the surface was the underside of the surface, and that's all I remember. In the meantime, Connie was still down below and couldn't breathe now because when I took my helmet up, her helmet was lower and because of the difference in pressure she wasn't getting any air.

CONNIE: I signaled emergency but got no response from Wes who was now at the surface.

WES: The next thing we knew we both

woke up laying crisscross on the stern end of that little boat in a tangle of hoses, and to this day we don't know how we managed to get there. Passing out from lack of air is very comfortable, it's just like going to sleep.

SDM: What aspect of your work has been most exciting for you?

CONNIE: As far as I'm concerned the most exciting part of our underwater work was the privilege of working together and sharing all of these experiences as husband and wife.

WES: Working together was the thrill. And we were entirely on our own.

SDM: Did you continue to lecture during the course of your underwater career?

CONNIE: Yes, it was our source of income. We lectured in the winter and hit all the high spots. We lectured at Columbia University and the Museum of Natural History. We charged \$100 a lecture, but our manager got 50 percent. The last few years we saw that we weren't getting anywhere financially so my father managed us. With having to pay our own expenses there just wasn't much left. People were kind to us though, and we did have a good time. You won't believe this, but I was looking through our old records the other day and during those years we lived on \$500 a year. As you know, we lived like the natives and we had nothing to spend money on. We could buy all our groceries for six months for \$200. And as long as we had enough for cameras and film that's all that mattered. For ten years we went back and forth to the Bahamas. We lectured for about 15 years. Then we opened up our printing business in '47 or '48. And right when we were getting started, the Society for Arts said they were having the presidents of all the garden clubs at their annual get together and would be terribly disappointed if we didn't come up that year to lecture. We had been showing them our films and lecturing to them over the years, so even though we should have stayed home and tended to our new business, we closed up shop for a few days. And while we were there, owing to the publicity in the papers, the Sailfish Club also asked us to stay on and lecture for them.

As Bernie and I bid these delightful people goodbye, I thought back on all that we had discussed: their marvelous films, their equipment which they still fondly display, their picture albums and the incredible adventures they had shared during their long and rewarding life. I could understand how they spent almost every hour together since 1933, the year they got married. At 75 they were still hopelessly in love with each other and had a zest for life that few people have today. And they have that great gift of instilling in one a love of adventure, making you realize that life itself, especially when spending it in a marvelous undertaking such as diving, is the greatest adventure of them all. 

Underwater Impressionism

The peace and beauty of the reef

By Frances McC. Ring

Beyond the sun-kissed shallows of aquamarine waters lies the world of the deep blue reef. Only as a diver — freed from the surface physically and emotionally — can I glide effortlessly for a reflective look at the intricate wonders of the living reef. It is in this world that my mind free-flows and I yearn to belong to this strange, surrealistic, yet beautiful submarine tableau.

The liquid dimension of ceaseless motion and constant visual changes assaults the senses; so long dulled by the flatness and over-simplification of the modern world; so long numbed by the colorless, futile activities of modern man; so long fatigued by the anxieties and pace of modern society.

Descent into the world of the reef sharpens the senses and frees the emotions; these are the elements which will provide the keys to understanding the underwater experience in and for itself.

For me, it is sheer fascination with the beauty, the drama and the unfamiliar of this world on the edge of the reef, which is the sirens' song. As I descend through the multi-hued rhapsodies into the darker blues, I marvel as forms fuse with colors in the shifting prisms of sunlight — until depth filters out the reds, oranges and yellows and the blue-green stretches out beyond my vision.

At last is shed the burden of my own corporal weight and I drift softly, quietly and willy-nilly. At last my mind is free to expand; my senses take over. My vision and attention shift from the blue-water space beyond me and contract to the minute world before me — thriving on a single coral head.

Hovering in the lee of the coral structure, a school of mixed grunts sways languidly in the gentle current; haughty angelfish mill about and gaudy parrotfish poke around in a melange of vivid pastels. It is an artist's orgy of delight on an ever-changing canvas.

I listen and hear the constant background profusion of snapping, crackling, crunching and ping-pong of the feeding, communicating sea life unseen.

I ponder the fragility of existence as I reluctantly ascend to my world of air, noise and human confusion above. In reaching toward the surface of the unbroken shafts of sunlight, I know that I will return — again and again. It is not for the mind to grasp and contain the underwater world, it is for the spirit to experience.

From the deep blue distance to the graceful swirl of schooling fish, the reef can fascinate and soothe those who take time to absorb its splendor.

photo/Geri Murphy



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AL MIKALOW

Treasure Salvor

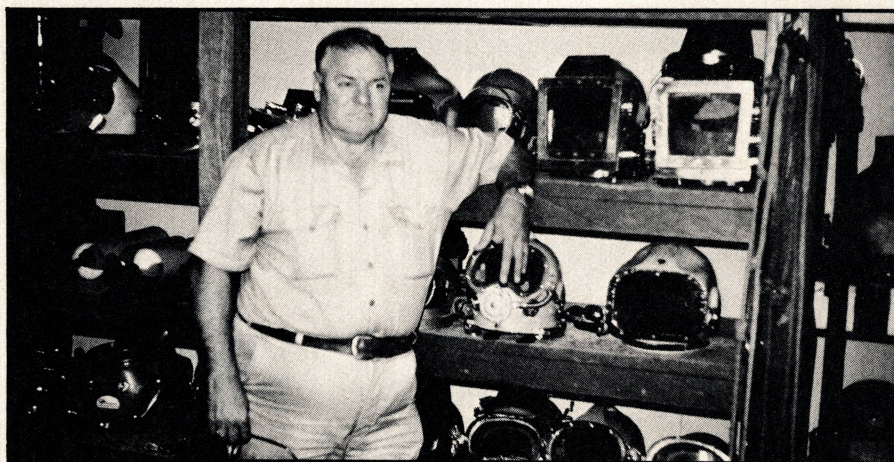
BY P. M. WRIGHT

The depths of San Francisco's murky bay abound in treasures earmarked for the hearty-hearted adventurer, the man with a strong back, an iron will and plenty of guts. That's what it takes to survive in the icy waters of the most treacherous bay on the West Coast.

Big Al Mikalow is such a man, and he'll tell you there's gold on the bottom of the bay, and practically anything else you might want. Mikalow is the two fisted patriarch of Northern California treasure hunters, the John Wayne of the underwater world. He's big, a yard across the shoul-

are willing to talk. Then and only then will you be able to put together the data you'll need to locate and bring up a fortune in gold or silver or priceless artifacts. "But," in Al Mikalow's words, "it's all worthwhile. And if you really want it, then it's there for the taking."

Of course the age old enemy of the treasure hunter is present in the bay. Her waters are constantly at work eating away wooden hulls and rusting out great hulks. The drifting, shifting sand is constantly piling up and burying treasure yards deep and rendering it nearly impossible



photo/P. M. Wright

ders, with legs the size of oak trunks. He gives the impression he could walk through a wall, or anything else that unfortunately got in his way. In short, he's tough, a very necessary quality for the lifestyle he follows.

Mikalow has spent a small fortune and a good part of his life searching for sunken treasure in the bay waters, and, not entirely unsuccessfully. "It's all down there," Mikalow says, "just decide what you want and then figure out how to get it."

Buried in the centuries old layers of silt, mud and sand are sunken ships, downed airplanes, new and used autos, cases of bootleg whiskey, gold and silver by the hundreds of pounds, brass cannons, guns, lead ingots, tin, aluminum, jewels, speed and sail boats, engines and anchors.

Finding these treasures takes more than just a strong back and will, it takes equipment and money. And maybe every bit as important as equipment and money is the ability to do some serious research. You have to be willing to pour over old newspapers and ship's manifests by the hundreds and interview those survivors of shipping disasters who

to get to without the aid of sophisticated and expensive equipment.

There was one fellow who spent many years diving in the bay and making his living at it, sometimes a very nice living. He's gone now, to Honduras, to dive where the water is clear and warm and there aren't so many restrictions put on such things as underwater explosives and the like. In the U.S. there are permits which are sometimes necessary. The Army Corps of Engineers wants its fingers in the mud and the State Lands Commission wants 25 percent of any loot you bring up, and if it's a big haul you might have to relinquish as much as 50 percent. These conditions make the bay area treasure hunters a closed mouth group. They are usually very silent about what they are doing and where.

A little research can give you an approximate location of the *City of Rio de Janiero*, a mail steamer that went down on February 22, 1901, with a loss of 131 lives and a vast fortune in gold and silver. No one has seen or touched the *Rio* since that fateful day, and somewhere in her watery interior lies a fine reward for the man with the ingenuity and guts to find

(Continued on Page 100)

Selecting a Dive Gear Bag

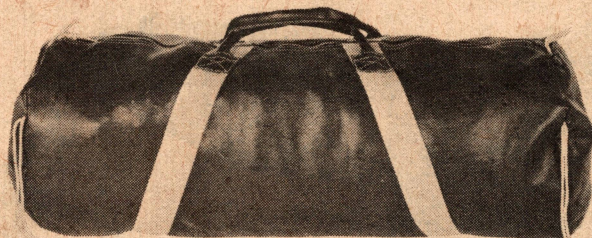


Basic tips on what to look for when
purchasing your next gear bag

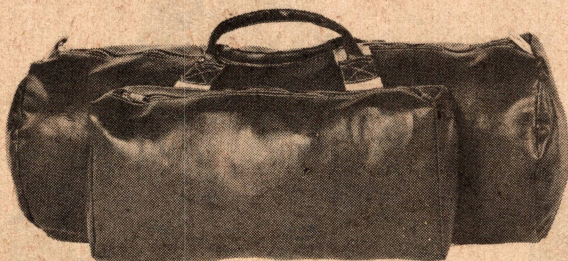
by Marty Snyderman

photo/Geri Murphy

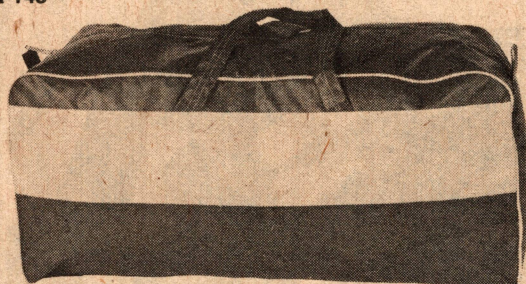
Gear Bags



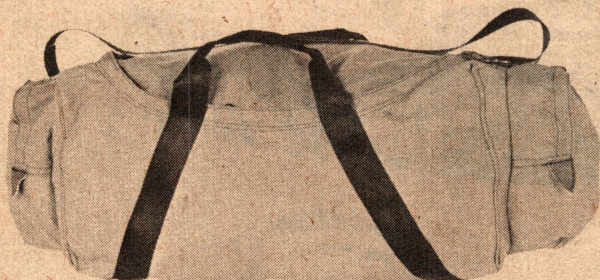
Aqua-Craft, Diver's Duffel, A-99



Aqua-Craft, Super Diver's Duffel, A-143



Aqua-Craft, Seafari Bag, A-160



Aqua-Craft, Pro Diver Bag, A-314

I can still recall the excitement of my first dive trip. I had finally acquired my own regulator and now had all of the necessary equipment, so I thought: The night before my trip I had carefully checked out all of my gear and then packed it in an old pillow case. I was ready to get wet! What more could I need?

The next morning I was up with the sun. I grabbed my pillow case full of gear and headed for the boat. Somewhere around the middle of the loading dock, in front of an entire boatload of experienced divers, my pillow case tore open. Surely you know the scenario from that point on. The old salts just shook their heads and turned away as I crawled around on the dock

retrieving my gear. My friends were not as kind as the old salts and I was thoroughly embarrassed by the time I finally boarded the boat. The answer to the question, "what more could I need?" had become painfully obvious. I needed a gear bag.

Believe me, during the day I looked at the gear bags the old salts were using and the instant we returned to the dock I was off to buy a duffel bag like theirs. At the dive store I received a lot of sympathy amid some teasing, but I couldn't buy a gear bag — the store didn't carry any. They suggested a nearby army surplus store and I went on my way, never really thinking about how strange it was that there were no dive gear bags in a professional dive store.

I bought a duffel bag and used it for several years. While it never tore open, it was never convenient either. No matter how I packed it, the first thing I needed was always on the bottom. And the problems of mildew and rot were never really solved.

Fortunately for all of us, things are quite a bit different today. Currently, there are several styles of gear bags made from a variety of tough, mildew-resistant materials.

In this article we will take a close look at those that are on the market today. We'll examine their intended purposes; the various styles and features; see how they are made; and, learn how to take care of them. Just as important, we'll show you the best way to pack so that your gear is protected.

PURPOSE OF A GEAR BAG

Gear bags serve their user in a number of ways. While the most obvious purpose of providing a carrying container for all of your dive gear can easily be seen, gear bags also provide a number of less obvious but equally important functions. The overall purpose is to make your dive trip easier, giving you more time and energy to enjoy the water. Certainly, making only one trip from your car to the beach or boat makes more sense than several trips. In addition to saving trips, a properly packed gear bag will help protect gear while it is being transported. Masks, gauges and regulators are designed to take the rigors of ocean use, but are not made to be stepped on, kicked, or to support the weight of tanks and weightbelts.

A gear bag announces to your dive buddies, "please don't throw me, sit on me, or stack things on me." A point that should be made here is that most manufacturers and instructors advise against carrying tanks and weightbelts inside of a gear bag. Everything else, from wet-suits to BC's, can be safely transported.

If you get in the habit of using your

bag, it will also help discourage loss of gear. At the end of a long dive day it is all too easy to walk off of a boat and leave a piece of gear stashed on a bunk. Gear losses like that are unnecessary and can be eliminated just by getting into the habit of packing your gear in your bag the same way all the time. An empty place in the bag alerts the owner immediately that something is missing.

On boat trips, equipment bags are an essential piece of gear. They help divers keep their individual equipment localized. Gear bags help define the area where you should dress and undress. Everyone has a place and the deck does not become a scene of mass confusion. Those people who are still using old pillow cases for gear bags are all too often the divers who can't find a fin when everyone else is fully dressed and waiting to go.

In addition, your gear bag is the perfect place to keep extras such as mask defogger and spare straps. Those items are often needed at the last minute and it is really convenient to be able to reach into a gear bag pocket and know just where they are. Empty pockets in the bag will serve as a reminder that you need to replace spares and you are, therefore, more likely to do so before it becomes an embarrassing emergency.

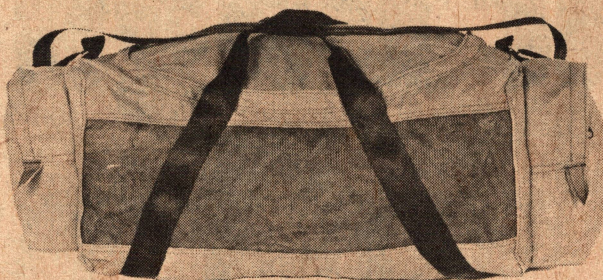
When traveling, a well made equipment bag should easily be able to hold all of your gear. It is much more comforting to be standing in line at the airport fully confident that all your dive gear is in your bag rather than trying to remember in which suitcase each piece is. And, when you return from a dive trip, it is nice to have a bag that is made to hold wet gear.

Once you are home, your equipment bag can serve as the perfect place to stow your gear. Certainly your wetsuit should be placed on a hanger, but most equipment can safely and wisely be stored in your bag.

GEAR BAG STYLES

Like most pieces of dive equipment, there are several different styles of gear bags available today. However, there are no well-defined, commonly used classifications. The descriptions I am going to use are ones that I have created in order to help me illustrate a few points.

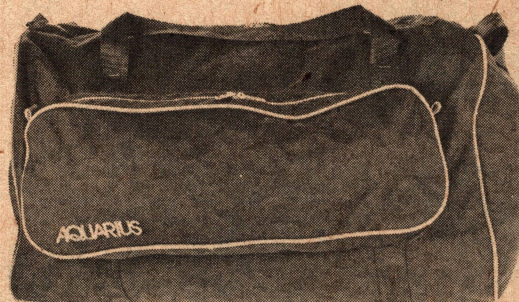
One of the major benefits of your equipment bag is that it helps you carry your gear. How the bag is designed to be carried is, therefore, a good way to classify the bags. Most bags are designed to be carried, (1) over the shoulder with a strap or straps, or (2) with handgrips or handles. Shoulder straps are usually adjustable. Carrying a heavy bag via the shoulder strap is often easier than carrying it by hand because you can use



Aqua-Craft, Pro Diver Bag, A-315



Aqua-Craft, Mesh Gear Bag, A-356



Aquarius, Super Duffel, 176



Aquarius, Equipment Duffel, 177



Cressi-Sub, Gear Bag, 918

more of your body to support the weight of the bag. Divers who try to travel light or who are constantly loading and unloading the bags from vehicles or boats often prefer handgrips. It is usually easier to grab a bag by a handgrip than it is to grab the longer shoulder straps. Handles that are padded, snap together, or that are doubled-over to provide cushioning

for your hand, are features that are well worth considering. The doubled-over strap is more comfortable to carry and is referred to as a contoured grip. Several manufacturers now provide bags with the option of a removable shoulder strap as well as handgrips, so that you can use whichever feature you prefer.

Other bags are designed to be carried

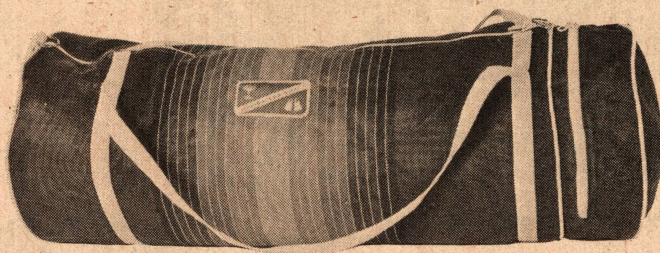
Gear Bags



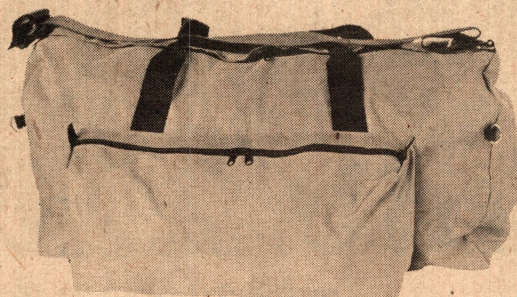
Dacor, EBD, 9101



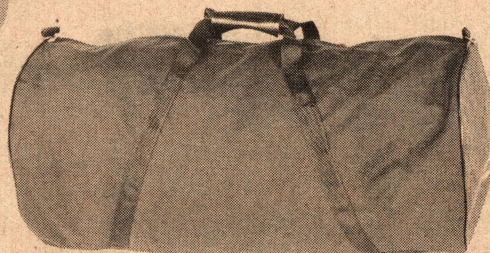
Divin' & Jivin', D-330



Divin' & Jivin', D-3301



Dolt, Deep Water Dive Bag, D139



Global, Dive Bag, 800

like conventional backpacks. Those such as the Seatec 1340 have two shoulder straps for this purpose. The Scubapro Carry-All even has an optional waist strap. If your equipment is particularly heavy, you are on the small side, or you make long hikes to get to remote dive sites, the backpack style can be a life-saver.

Another way to classify the variety of gear bags is to examine the material they are made of. Most bags are made of nylon, Herculite (a reinforced nylon), a type of vinyl, or Naughahyde while others are made from vinyl coated polyester, mesh, or high impact plastic. The mesh bags are particularly nice for divers who are hand-carrying and not shipping their

bags. Mesh bags provide excellent drainage and ventilation but not as much in the way of protection.

Most nylon, Naughahyde, vinyl and plastic bags afford the luxury of making a beach dive and then immediately placing the wet gear inside a car without soaking the floor or seat. And when traveling, those bags help disguise the exact contents of your luggage because they are opaque. Many bags also provide pockets, a feature not found on mesh bags.

FEATURES

The different gear bags on the market incorporate a variety of valuable features. While some, such as pockets, are easy to see, other equally important features such as ease of use and size are a little more difficult to judge unless you do some homework. The size of the bag is very important. Large gear bags provide close to 5000 cubic inches (approximately three cubic feet) of packing space. Medium sized bags yield about 4000 cubic inches and small bags, close to 2700. Any bag smaller than that is considered to be an accessory bag. Large bags are usually preferred by divers who need to pack drysuits, full one-quarter inch wetsuits, buoyancy compensators, backpacks and spare parts. Having the room to include an extra regulator or console can be really important if you need spares when you are at a remote dive site. There is, however, no need to carry the extra bulk of a large gear bag if you leave your suit or BC on your boat, or if you need only a shortie suit and the boat supplies the extras.

To clear up a point of potential confusion, some manufacturers provide only two measurements — length and diameter — when they supply specifications. These measurements are given for bags with less rigid frames. When packed, the bags are tube shaped and when empty, they are collapsible. Aqua-Craft's mesh bags are examples. The larger of these bags is about 30 inches long and 15-20 inches in diameter.

Some bags come equipped with one or more pockets on the outside, some, on the inside, and others provide either both or neither. Many new divers tend to overlook the value of having pockets, but most old timers find a use for them, packing extra straps, delicate gauges, etc.

Outside pockets are usually larger than internal pockets and most outer pockets feature a heavy duty, lockable zipper. For local trips, many divers pack their regulators and gauges in outer pockets but I'd recommend not doing that when air transportation is involved. Those items should be carefully cushioned on the inside and not packed in a way that makes them susceptible to the

pounding baggage occasionally gets.

Smaller, inside pockets are the perfect place to keep important items such as a copy of the dive tables and a spare buckle. Vinyl lined inside pockets can be a good place to keep clothes and other items that need to stay dry. A fold-over seal, velcro closure, or zipper will prevent items from spilling out of the pockets should the bag be turned over during shipping. Several small inner pockets, cleverly made by partitioning one large pocket are found on many bags.

Another important feature to consider is the comfort of the bag's strap system. A full gear bag can easily weigh more than 30 pounds. The strap should be wide enough to provide a secure base so it doesn't dig into your hand or shoulder. Some manufacturers, such as Dacor, use a movable shoulder pad for added comfort and protection. On some bags, the shoulder straps can be adjusted for length. Contoured handgrips often employ a snap-around pad that fastens them together.

Drainage and ventilation should not be overlooked. It is much easier and more pleasant to carry dry, aired-out equipment. Obviously, mesh bags provide the best drainage and ventilation. Several of the nylon and polyester bags have panels made of mesh. Stainless steel or brass grommets in the bottoms of other bags drain excess water. The user must, however, be careful not to accidentally block the grommets and to make sure these are at the bag's low point.

Zippers too, should be considered. In past days it was all too common to hear stories of frustrated divers who had to cut their gear bags open because the metal zippers had corroded shut. Improvements have been made in the metal alloys and many manufacturers now use non-corroding plastic or nylon zippers. The larger the zipper tooth the easier it is to use, but, the smaller the tooth, the better the seal. Zippers should be lockable for travel and many bag makers currently utilize two pulls on their zippers so that the slides lock together in the middle of the zipper track rather than at one end. Using two slides that meet in the middle (or wherever you so desire) makes closing a fully packed bag much easier. The horseshoe-shaped zipper used in Parkway's Garment Carry Bag, Imperial's Turtle-Up, and some Aqua-Craft bags also allows for easier closure when the bag is full.

D-rings, bag loops, and tassel-like ropes on the outside of the gear bag are useful if you need to attach accessories, such as spearguns, to the bag. Spearguns are often too long, even when broken down, to fit inside a bag and they can easily get lost in shipping unless they are attached to another piece of equipment.



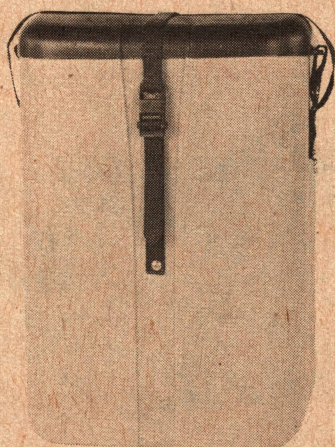
Global, Super Dive Bag, 808



Imperial, Turtle-Up Bag, 1307



Parkway, Garment Carry Bag, YZZ00300



Scubapro, Diver's Carry-All, 53-786



Scubapro, Diving Gear Bag, 53-720

Other features offered on some bags are your dive shop's logo or your name screened onto a side panel, or a fold-out flap that can keep equipment out of sand or mud.

MATERIALS

Gear bags are made from a variety

of materials. Within the nylon grouping you can find bags made of Cordura, 1000 denier, "rip-stop," ballistic, and mesh. All of those provide bags with excellent durability. The heavier grades of nylon, such as the 11 ounce double-K-Koated Cordura used by Dolt, give the extra toughness needed by divers who are hard on their gear.

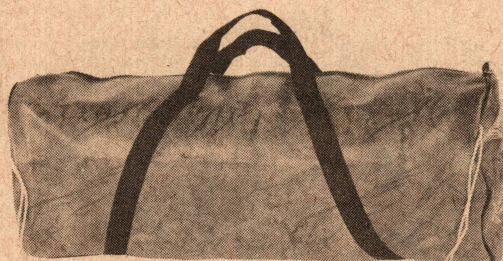
Gear Bags



Seatec, Backpack Style Bag, 1340



Seatec, Large Dive Bag, 1335



Sport Divers, Deluxe Heavy Gear Bag, 700



Sport Divers, Seafarer 1, 715



Sport Divers, Seafarer 2, 716

Herculite, Naughahyde, and expanded vinyl all have a similar look and feel. I questioned their tear resistance but Dacor's Herculite-made EDB comes with a "try to tear me" sample and all I can say is that I now understand the derivation of the name Herculite.

The materials come in a number of colors but not all materials come in all

colors. If color coordination is important to you, be aware that selection is limited in some fabrics.

Some gear bags are rubberized, coated or waterproofed. This protection is an excellent feature that will add to the bag's longevity by preventing rot. It will also help minimize the weight of a bag when it is full of wet gear.

Most bag straps are made of polyester, nylon, and polypropylene fabrics. Two inch straps are the widest presently offered. Straps are often sewn to the bags with nylon upholstery thread or polyester thread. The threads are often double or triple stitched for reinforcement. In some cases extra reinforcement is supplied by a double-thickness bag at the strap-bag junction.

CARE AND MAINTENANCE

Equipment bag care and maintenance is easy. All that is needed in most cases is an occasional rinsing and drying. Metal zippers should be lubricated every half-dozen trips and all zippers should be kept free of debris that can cause teeth to pull out or misalign. Even though many bags are treated with some type of waterproofing it is a good idea not to let excess water collect in the bottom of a bag for a long period of time. Standing water will eventually lead to rotting, mildew and bad odors. Mild detergents can be used to get rid of unpleasant odors, but be sure to thoroughly rinse your bag after using any detergent to prevent contact between the soap and rubber goods or breathing apparatus. Like most fabrics, it is a good idea to dry the bag away from direct sunlight, and bags should be stored in a cool dry area between dives. According to most instructors, it is fine to store gear other than wetsuits and deflated BC's in your bag.

Other than those common sense basics it should be pointed out that the lifetime of your bag depends greatly on how you treat it. Overloading and trying to force zippers to close will shorten the life considerably, as will packing items that are too long or too sharp. When storing, hanging a bag full of gear by the handles or straps is not recommended because of the excessive long-term stress at the bag/strap junction.

PACKING A GEAR BAG

Three factors come into play when you consider the best way to pack your gear bag. These are the ease of use, protection of equipment and balance for carrying. A well organized bag can help prevent a lot of unnecessary problems and will make odds and ends easier to find. Straps and other small items fit best in easily accessible pockets while regulators are best protected if they are packed inside the sleeve or leg of a wetsuit. An idea that helps me is to keep everything I know I will need like my mask, fins, knife, regulator (gauges and stages inside of booties and hood) and gloves inside a small mesh bag kept in my larger bag. The rest of my bag is used for my wetsuit, BC system and spares. On a boat or at the beach I keep the mesh bag readily

GEAR BAG MANUFACTURERS

MANUFACTURER	MODEL/ CAT. #	VOLUME/ DIMENSIONS	MATERIAL	ZIPPERS/ HARDWARE	POCKETS	DRAINAGE/ VENTILATION	STRAP/ HANDLES	COLORS	NOTES	PRICE
Aqua-Craft, Inc.	Pro Diver Bag, A-314	2.5 cu. ft.	Nylon	Two nylon zippers	Two outside	Zipper	Shoulder strap, handgrip	Blue	Horseshoe zipper	\$ 68.00
	Pro Diver Bag, A-315	2.5 cu. ft.	Nylon	Two nylon zippers	Two outside	Mesh panels	Shoulder strap, handgrip	Blue	Horseshoe zipper	64.00
	Seafari Bag, A-160	11.5x12x26" 2.2 cu. ft.	Vinyl	Silver nickel		Zipper	Handgrip	Blue/white	Two D-ring bag loops, logo on bag, \$20.00	34.95
	Diver's Duffel, A-99	30x13"	Vinyl	Silver nickel		Two grommets	Handgrip	Red & white	Tassles on outside, D-ring like bag loop	33.95
	Super Diver's Duffel, A-143	30x13"	Vinyl	Silver nickel	One outside	Two grommets	Handgrip	Red & white	Tassles on outside, D-ring like loop	39.00
	Mesh Gear Bag, A-356	30x21"	Nylon mesh	Nylon		Mesh bag	Handgrip	Green	D-ring locking loop	19.95
Aquarius Mfg. Co.	Equipment Duffel, 177	15x12x27" 4700 cu. in.	Nylon, polyurethane inside	Two nylon zippers	Two outside	Zipper	Shoulder strap, handgrip	Black/red	Four D-ring like loops on outside	\$ 28.50
	Super Duffel, 176	15x27x12" 5000 cu. in.	Nylon, polyurethane, inside	Two nylon zippers	One outside	Zipper	Shoulder strap, handgrip	Black/red	Two D-ring like loops on outside	40.95
	Double Pocket Duffel, 179	34x15x13"	Nylon	Two nylon zippers	Two 5 inch wide	Zipper	Shoulder strap, handgrip	Black/red		59.95
Cressi-Sub	Gear Bag, 918	28x12"	Nylon, rubberized backing	Nylon	Three inside, one outside	Zipper	Contoured handgrip	Yellow & black	Two D-ring like loops on outside	\$ 50.00
Dacor Corp.	Deluxe EBD, 9101	26x12x14"	Nylon	Nylon		Two grommets	Contoured handgrip	Red	Two D-rings, plastic ident. tags and no-decom. limits	\$ 37.00
Divin' & Jivin' Society	D-3301	13x30"	Open-mesh, vinyl-coated	Nylon	One outside, one inside	Mesh bag	Shoulder straps	19 patterns, var. colors	Two D-rings	\$ 55.00
	D-3261	13x26"	Open-mesh, vinyl-coated	Nylon	One outside one inside	Mesh bag	Shoulder straps	19 patterns var. colors	Two D-rings	50.00
	D-330	13x30"	Open-mesh vinyl-coated	Nylon	Inside	Mesh bag	Shoulder straps	19 patterns, var. colors	Two D-rings	38.00
	D-326	13x26"	Open-mesh vinyl-coated	Nylon		Mesh bag	Shoulder straps	19 patterns, var. colors	Two D-rings	33.00
Dolt of Calif.	Deep Water, D139	30x15x11" 4600 cu. in.	Waterproofed nylon	Two nylon zippers	One outside	Two grommets	Shoulder strap, handgrip	Blue, red, navy	Two D-rings	\$ 52.00
	Treasure Hunter, D111	30" 3600 cu. in.	Waterproofed nylon	Two nylon zippers	Two outside	Zipper	Shoulder strap, handgrip	Blue, red, navy	Two D-rings	51.00
	Ultimate Travel Pack, D156	24x15½x8½" 3200 cu. in.	Waterproofed nylon	Two nylon zippers	Two outside	Zipper	Backpack-style straps	Blue, red, navy		110.00
	The Lagoon, D126	29x13" 3800 cu. in.	Waterproofed nylon	Two nylon zippers		Zipper	Handgrips	Blue, red, navy	Optional snap-on shoulder strap	34.00
	The Whale, D148	35x15" 6000 cu. in.	Waterproofed nylon	Two nylon zippers		Zipper	Handgrips	Blue, red, navy	Optional snap-on shoulder strap	46.00
	Island Wetsuit Bag D331	26x20x5"	Waterproofed nylon	Two nylon zippers	Flap pockets, inside & out	Zipper	Handgrips	Blue, red, navy	Fold out dressing flap 28x19"	57.00
Global Mfg. Corp.	Super, 808	30x15"	Vinyl, nylon, mesh	Nylon	One outside, two inside	Grommet	Shoulder strap, handgrip	Several colors		\$ 45.00
	Dive Bag, 800	30x15"	Vinyl, nylon, mesh	Nylon		Vented ends, grommets	Shoulder strap, handgrip	Red, black, or blue		26.00
Imperial Mfg. Co.	Turtle-Up, 1307	26x20x6"	Vinyl	Nylon	Three inside	Zipper opening	Snap-together handgrip	Black	A fold out 6" by 2" flap dressing platform	\$ 26.25
Parkway Fabricators	Garment Carry, YZ200300	26x20x6"	Nylon	Nylon	Three inside	Grommet	Snap-together handgrip	Blue	D-ring	\$ 32.00
Scubapro	Gear Bag, 53-720-00	25x15x12"	Reinforced vinyl	Nylon	One inside	Grommet	Snap-together handgrip	Black		\$ 54.00
	Diver's Carry-All, 53-786-00	16x10x23"	High-impact plastic	Buckle, strap on lid		Lift-off lid	Handgrip shoulder, waist strap	Blue/black	D-ring	64.00
Seatec	Large Bag, 1335	29x15x13"	Nylon	Nylon	One outside	Grommet	Shoulder strap, snap-together handgrip	Blue	Two D-rings	\$ 58.50
	Backpack Style, 1340	10x16x24"	Nylon	Nylon	Three outside, two open-top, with zipper	Grommet	Backpack-like straps, handgrip	Blue		66.50
Sport Divers Mfg.	Deluxe, 700	30x21"	Vinyl	Nylon		Grommet	Handgrip	Red-orange	D-rings and two pair of tassles	\$ 34.95
	Seafarer 1, 715	27x25"	Vinyl	Nylon	One outside	Grommet	Shoulder strap, handgrip	Red-orange	D-ring	40.95
	Seafarer 2, 716	24x24"	Vinyl	Nylon	Two outside	Grommet	Shoulder strap, handgrip	Red-orange	Two D-rings	48.95
	Sport Diver 1, 717	26x24"	Nylon	Two nylon zippers	One outside	Grommet	Shoulder strap, handgrip	Red-orange	Two D-rings	45.95
Sub-Aqua Specialties	Large Bag, 952-1224	28x15"	Nylon	Nylon	One outside	Zipper	Handgrip	Red & blue	Two D-rings	\$ 28.95
Sub-Aquatic Systems	EZ-36	25.5x14x4"	Nylon	Two nylon zippers		Grommet	Handgrip	Orange & blue		\$ 32.00
	EX-37	23x9.5x9.5"	Nylon	Nylon	One outside	Mesh areas in bottom and pockets	Shoulder strap, handgrip	Blue		26.00
U.S. Divers	Gear Bag, 7417	30x12x12"	Nylon	Three nylon zippers	One outside	Mesh panels	Snap-together handgrip	Blue		\$ 49.50

Gear Bags



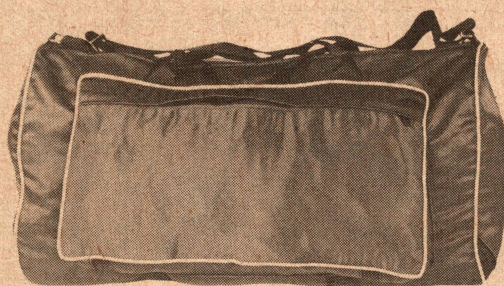
Sport Divers, Sport Diver 1, 717



Sub-Aqua Specialties, Large Gear Bag, 952-1224



Sub-Aquatic Systems, EZ-36



Sub-Aquatic Systems, EZ-37



U.S. Divers, Gear Bag, 7417

available and place the organized gear bag in an out-of-the-way, yet convenient area. When the mesh bag is empty it goes on the top of my gear bag.

A properly packed bag can be a lifesaver, or at least a dive saver, when it comes to protecting your gear. First, pack items that can take a little pound-

ing, such as your backpack, next to the shell of the bag. More delicate or expensive items should be cushioned by placing them inside a towel or the part of your wetsuit that is nearest the center of your bag. I wrap my wetsuit around the small mesh bag that contains breakables. If the two bag idea does not appeal to you,

be sure to place your mask inside a wetsuit sleeve or towel for added protection. Do yourself and your buddies a favor by protecting your gear.

It is best to try to evenly distribute the weight in the bag. A well-balanced bag is easier to lift, carry and load. And finally, proper weight distribution will make sure that parts of the bag are not overstressed, shortening its life.

CHOOSING A BAG

Selecting a gear bag that fits your needs is relatively easy. Considering the variety available, there are several bags that will work for most divers. All that is needed is a little common sense and an understanding of your particular needs.

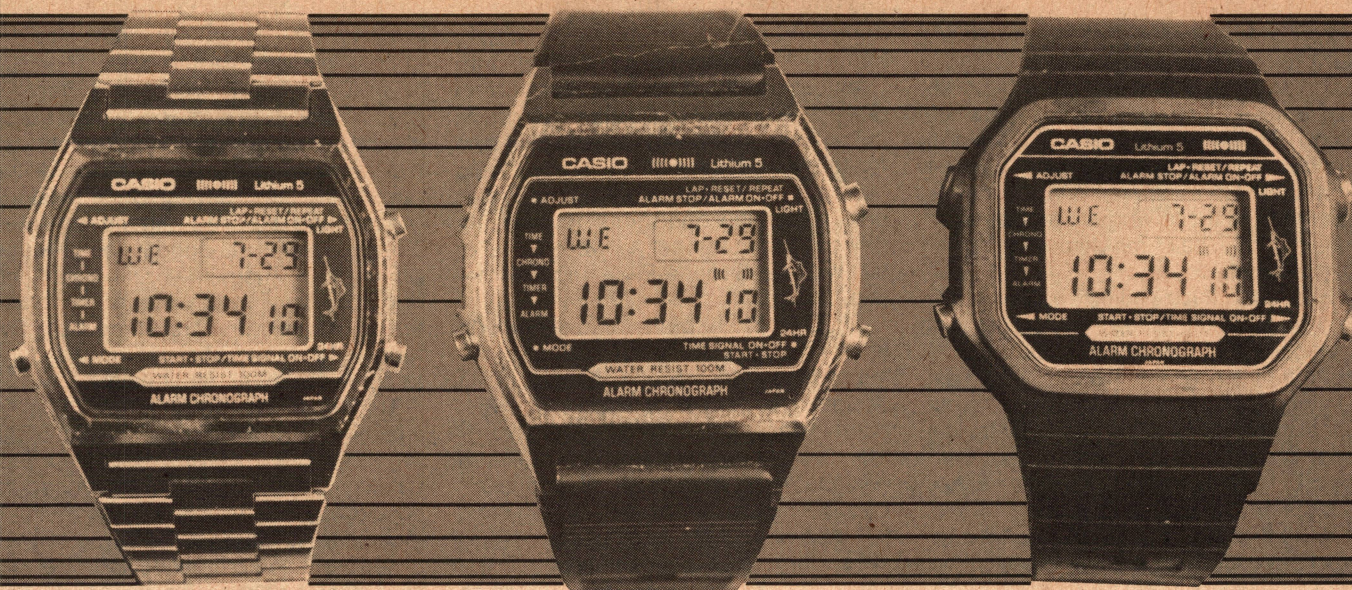
You should ask yourself a few questions. Do you travel by plane, boat or car with all of your gear? How much equipment do you take with you? Do you need to pack extra regulators, suits, compensators and other large pieces of equipment? Do you generally leave some of your gear on your boat? Do you hike to your dive site, drive or arrive by boat or plane?

Another factor to consider is the climate in which you do your diving. A Canadian friend recently told me that he uses a dark colored bag because it absorbs heat and makes his wetsuit toasty warm when he puts it on. If you have never dived in cold water this might sound farfetched, but he was as serious as he could be. Conversely, in hot tropical areas light colored bags which reflect heat can help keep your equipment cool. (Bag coloration alone might not do the job, but it is best to keep your equipment away from temperature extremes, and every little bit helps.) In conjunction with the question of climate, consider how and where you dry your gear. Do you hang it up on the boat for a long ride home or do you put it into your car as you take it off?

If your diving is as varied as mine, you might find two bags to be the best solution. I have one large bag that I use when air travel is involved and a medium sized bag for local trips. When I travel I take everything because I never know exactly what I will need. On local trips, when I have to carry gear up and down the dock, lighter is better. Either way, I keep all of my absolute necessities in an easy-to-drain and ventilated mesh bag.

CONCLUSION

In summation, gear bags, a once overlooked piece of equipment, are now recognized as a necessary item. A well-made, properly used bag will help add pleasure to your dive adventures. Your bag can help you avoid some problems, solve others, and give you more time and energy for the dives that await you.



photo/Geri Murphy

The Casio Watersports Watch is probably the most controversial timepiece in diving today. It has been the focal point of much debate and considerable consumer doubt, not because of poor performance, but rather from the poor wording of the literature that comes with it. The problem grew to such magnitude that even Undercurrent joined the fray in challenging the true meaning of the manufacturer's claims.

The turmoil surrounding the Casio Watersports Watch stems from a problem of semantics. It goes something like this:

Casio designed and produced an inexpensive, water resistant watch called the Casio 106. It has a 12 digit LCD (liquid crystal display) that operates in four different time modes. It provides the time, date, day of the week, stopwatch functions and special alarms. It is powered by a lithium battery which lasts for five years.

Casio decided to offer the 106 in three design variations with different outer cases, watchbands and prices. But as far as Casio was concerned, all three are still basically Model 106. The instruction manual packed with every watch simply identifies all three timepieces as, "Module No. 106."

So far so good, but now the story gets complicated. Casio does not sell its watch directly to divers. Instead, it distributes this watch to two other companies who advertise in SKIN DIVER. DWS Marketing International of Costa Mesa, California and On The Run of Moorhead, Minnesota are the two distributors. Dive shops also sell the Casio Watersports Watch.

For purposes of advertising and inventory control, the two distributors have given the Casio 106 their own model numbers. On The Run identifies the three Casio watches as the W-100, W-150 and W-150C. Meanwhile, DWS Marketing International identifies the three Casio versions as the Casio Mar-

SKIN DIVER TESTS THE CASIO MARINER WILL IT WORK?

by Geri Murphy

iner #91, #95 and #98. Here lies one of the major sources of consumer confusion, as all seven model numbers actually refer to the same basic timepiece.

Another source of confusion and consumer doubt is the apparent discrepancy between the wording which appears in the two distributor ads and the wording in the small manual which comes packaged with the watch. Both ads claim the Casio Watersports Watch has been tested beyond 300 feet, and they imply that the watch would be great for scuba diving. Why else would they be advertising in a dive publication such as SKIN DIVER? However, the Casio Manual carries one small sentence, on page 10, which seems to cast a great deal of doubt on the underwater performance of this watch. The little manual states that the watch is, "not specially designed for scuba divers." Purchasers who take the time to read this apparent disclaimer usually panic.

In checking into this problem, SKIN DIVER found that the Casio watch was indeed tested to 300 feet as the ads indicate. The watches are placed in a pressure chamber and taken to a simulated depth of 100 meters (330 feet). Casio confirms this testing procedure by engraving the backside of every watch with the statement, "100M Water Resistant."

Why the contradictory statement in the manual? According to Clifton Rodenburg, president of On The Run, it is one of those little quirks that occurs when a Japanese copywriter attempts to write an English language instruction manual.

Obviously not a diver himself, the writer of the manual was attempting to state that the Casio Watersports Watch was versatile. Not just for scuba divers, it can also be used by swimmers, surfers, sailors, snorkelers and waterskiers. Little did he know that this one innocent statement would cause such a furor in the dive industry.

Still have some doubt about the integrity of the Casio watch? SKIN DIVER decided to put this stormy controversy to rest by test diving the watch. We sent away for each of the three Casio models advertised by On The Run — the W-100, W-150 and the W-150C. These were stock items right off the distributor's shelf.

SKIN DIVER then took the three watches to the Bahamas for two weeks of testing. Each watch was worn on three daily dives in depths ranging from 20 to 130 feet. The normal routine consisted of a deep morning wall dive, followed by a shallow dive. The afternoon dive was generally to middle-range depths. In other words, the watches were subjected to a normal sport diving pattern. This included altitude tests during two cross-country flights on DC-10 jets and two inter-island flights on smaller propeller-type aircraft. By the end of the two weeks, these Casio watches were well traveled and well dived.

All three watches performed beautifully. They never leaked a drop and each one kept perfect time. In addition, the three Casio watches operated in all four modes, including the alarm which could be clearly heard underwater.

Later on, I learned that the head dive-master at this same Bahamas resort had been wearing and diving a Casio watch for over four months. That is more than 100 dives without a single problem.

SKIN DIVER's conclusion? We found that the Casio Watersports Watch works well for scuba diving, despite what the manual says. There is truth in advertising!

Just when we thought we had mastered all the acronyms associated with our favorite sport (whose name itself is an acronym), a new one comes along: SPEC. According to the folks at Scubapro, SPEC stands for Silicone Protected Environmental Cap and it is important to those who are interested in maintaining their regulators at peak performance.

How often have you arrived home late and weary after a hard day or night of diving, and left your equipment in the garage, intending to wash it the next morning? You will recall those intentions three days later when a strange odor has begun to emanate from your gear bag. Or how about that dive trip to a remote tropical island, where the limited fresh water couldn't be spared for washing your body, let alone your regulator? Let's face it. We all know our regu-

lators should be thoroughly rinsed after each dive, but there are times we can't or don't, or give in to other priorities. So we let the sand, salt and grit do its worst to the delicate fittings of the first stage.

Environmental kits have been around for a few years, but two factors make SPEC unique. First, Scubapro feels this feature is important enough to include on all new regulators as standard equipment. Second, the patented SPEC is a simpler system and, according to chief engineer, Dennis Hart, more effective than any other environmental cap.

The first environmental kit was developed to prevent the regulator's first stage from freezing in extremely cold water. It is standard equipment on all regulators used by the Canadian armed forces — Scubapro Mark V's. The kit provided a barrier between the O-rings in the first stage and cold or contaminated water. Thus, the environmental kits were also used for diving in waters that contained abrasive particulate matter that could damage the O-rings.

Scubapro's version of the kit was selling quite well in Florida, California and

the Caribbean, far from the icy waters for which it was originally intended. Eventually, word began to filter in from dealers that rental regulators fitted with the environmental kit had less down time for repairs, especially first stage O-ring leakages. The company realized it was onto something good and put their engineering department to work. The result was the Silicone Protected Environmental Cap.

SPEC is Scubapro's third generation environmental cap. What makes it different is the technical simplicity of its design. The ambient pressure cap has been redesigned to allow the dealer, or the diver, to fill the ambient pressure chamber with a special silicone compound. The grease fills the void between the piston and the spring, and is retained there by the small orifices in the cap. The silicone not only transmits

is completely filled with grease to the outside diameter of the coils. Then the cap is replaced and the system is pressurized. Intermediate pressure should be set between 128 and 140 psi.

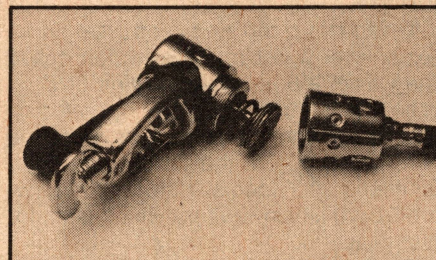
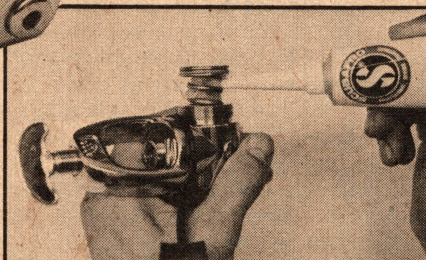
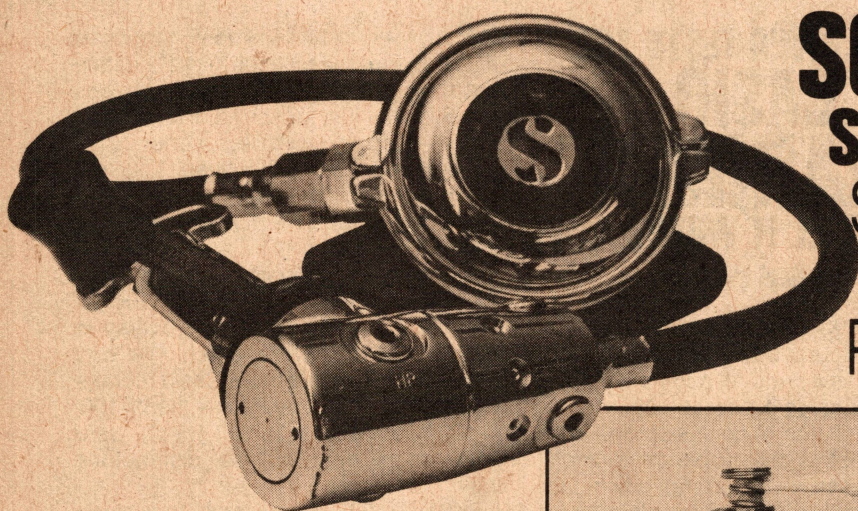
It is possible for the diver to fill the cap using the seven gram silicone grease tube supplied with the regulator. The regulator is attached to the tank and pressurized. Then the nozzle of the tube is placed against any one of the countersunk holes in the first stage cap. The tube is squeezed until the grease starts to come out of the other holes.

The first method is preferred because it results in a more complete filling of the regulator, but it requires the tool for partial disassembly. The second procedure should be done by the diver every three months to assure that the cap is full.

Scubapro recommends that the environmental silicone be replaced each

SCUBAPRO'S New Siliconized Regulator's Special End Cap Provides Long Life Plus Better Performance

Text and Photography
by Eric Hanauer



The ambient pressure chamber on the regulator first stage (open at right) is now filled with a special silicone compound (left) which transmits pressure but blocks out water and dirt.

water pressure, but also acts as a lubricant reservoir for the first stage O-ring, with which it is always in contact. This is by far the simplest environmental kit yet designed, with no additional parts, moving or otherwise.

The lubricant is especially formulated with virtually no liquid silicone. It will retain its consistency at high temperatures, such as those sustained when the regulator is left out in the sun. For this reason the manufacturer cautions that only the special Scubapro lubricant should be used.

The material is applied by the dealer at the time of purchase in a five minute procedure. He removes the first stage cap with a special spanner wrench, leaving the spring and piston in place. The gap between the spring and piston

time the regulator is serviced, and the regulator should be serviced at least annually. Scubapro engineer, Dennis Hart, also emphasizes that SPEC is no substitute for proper regulator care and maintenance. Among other reasons, it provides no protection for the second stage.

If you are convinced by now that the environmental cap is a good idea, but are still emotionally attached to your old Scubapro regulator, don't despair. A conversion kit is available from the factory which will upgrade any first stage, except the Mark VII, into a SPEC regulator.

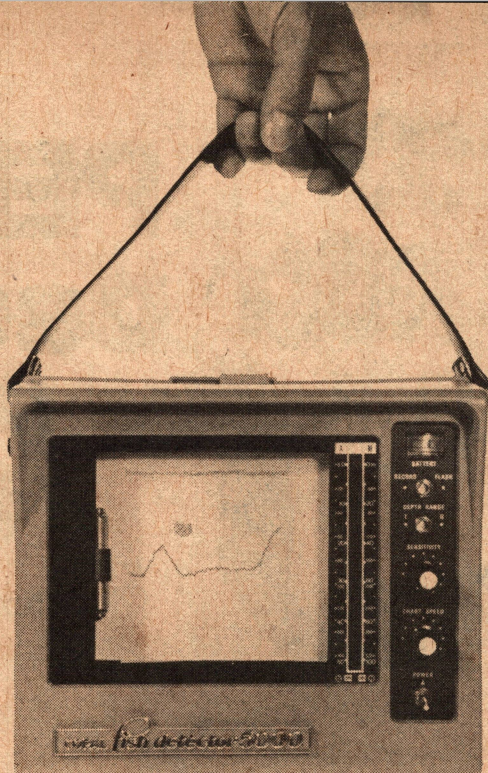
The system has undergone nine months of testing and is now on the market, where it will add another first to Scubapro's long list of innovations.

The Copal Fish Detector 5000 is a ruggedly built, highly accurate depth/fish finder that was designed with pleasure boaters in mind. The unit is compact and easy to use. Its main purpose is simple. The Copal 5000 is designed to provide a map of the bottom and locate schools of fish in water up to 328 feet deep. Much like the other Copal Fish Detectors, models 5200 and 3100, the 5000 can provide an easy-to-read, permanent record of the seascape, which can be used for channel maps or bottom surveys. For simplicity's sake, the Copal 5000 is called a fish detector, but it could just as accurately be described as a depth finder, chart recorder, and surveying tool. As you can see, the unit is quite versatile and has numerous applications to the world of boat divers.

The Fish Detector utilizes supersonic sound waves to map out ocean bottom or locate schools of fish. Once the unit has been installed on your boat, with the recorder in the wheelhouse and the transducer attached to the hull somewhere below the waterline, it will operate on much the same principle as an echo. A built-in oscillator, inside the transducer, sends out a pulse of supersonic waves at a speed of 1500 meters per second. When the sound waves strike either a school of fish or the bottom, they bounce back to the oscillator. The waves are then amplified, the time difference between the time the wave was sent and when it was received is electronically processed, and the information is shown on an easy-to-read viewing screen. The information on the screen can be viewed as either a flashing LED (Light Emitting Diode) or in the form of a permanent graph recorded onto paper tape. More simply put, the Copal 5000 takes the information provided by the sound waves and draws a picture of what lies below the boat. The picture includes the surface, the bottom, and objects in between the two. These objects can be a school of fish, a seamount, a wreck, a shallow reef, etc.

By looking at the scale on the right hand side of the viewing screen you can tell how tall a seamount is, or how deep a school of fish is. The scale is stated in both feet and meters. A simple flick of a toggle switch on the control panel allows the user to monitor between the surface and 164 feet (50 meters) or the surface and 328 feet (100 meters). And better yet, the Record/Flash control allows you to decide whether you want the LED display or the permanent record. (This can save on paper costs.) Either mode operates while the boat is traveling or at anchor. Best of all, both modes are easy to use. All of this means more time saved on the surface and less time lost underwater looking for that special crevice, reef, or wreck.

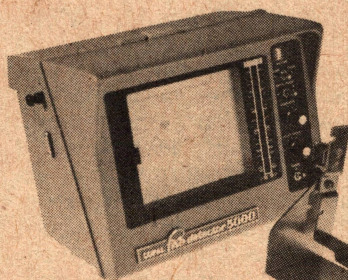
The Copal 5000 comes complete with



COPAL 5000 Depth Finder

Portable Electronic
Device Helps Find Your
Favorite Reef

By Marty Snyderman



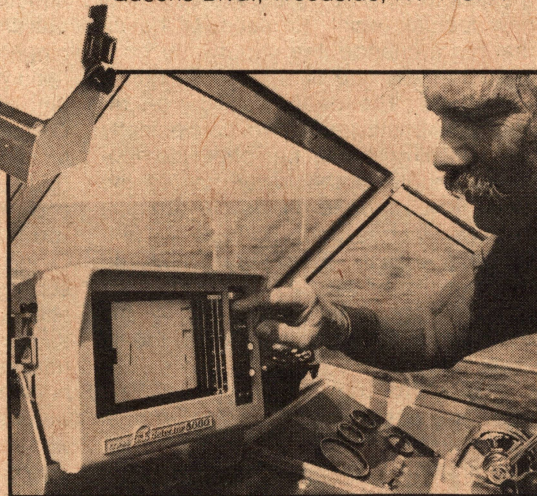
photos/Marty Snyderman

Above, the Copal 5000 comes complete with a stainless steel mount. The instrument can be quickly removed from the mount when necessary. Right, unit has controls for sensitivity, depth and chart speed. Information can be viewed as LED or paper record.

a stainless-steel stand, a carrying strap, two rolls of easy-to-load paper tape for the chart recording, a transducer with a 26 foot long cable, battery terminal wires and all of the necessary tools, screws, and bolts required to mount the unit to your boat. In addition, a dust cover is provided to protect the attractive blue casing when the item is not in use. The cover is especially useful if your storage area is subject to salt spray.

The power consumption of the Copal 5000 is approximately four watts and its output into the water is 40 watts. The unit operates on either one 12 volt DC battery or 8 UM-1 batteries. The detector's abilities are unaffected by power fluctuations of up to 20 percent. The solid state construction and stainless guts supply the needed durability. The entire product, including the stand, weighs only 6.6 pounds and it has external dimensions of only 10.8 x 7.7 x 10.8 inches. The Copal 5000's light weight and compact design make it as portable as a transistor radio. And the clever double-stand feature allows you to easily and quickly remove the control panel and viewing screen for storage, without disassembling the more permanent mount. The 75 kHz barium titanate oscillator and the interpretive electronic capabilities provide information that is accurate to within plus or minus four percent. Other useful features located on the control panel to the right of the viewing screen include: a battery check indicator; a sensitivity control which allows you to reduce interference; a chart speed control which can provide more detail in survey work; and a power switch. On the backside of the unit you will find the battery terminals and the jack for the transducer cable.

The Copal 5000 Fish Detector is easy to install, and once in place it will help you get the most out of your boating and diving day. It sells for \$280.00. For further information about the Copal 5000, 3100 or 5200, contact your dive store or the Copal Corporation of America, 5601 Queens Blvd., Woodside, NY 11377.



photo/Eric Hanauer



**Text and Photography
by Geri Murphy**

The Pelican has done it again. He took a good idea and made it better! 

SDM travel

SECTION

GUADELOUPE

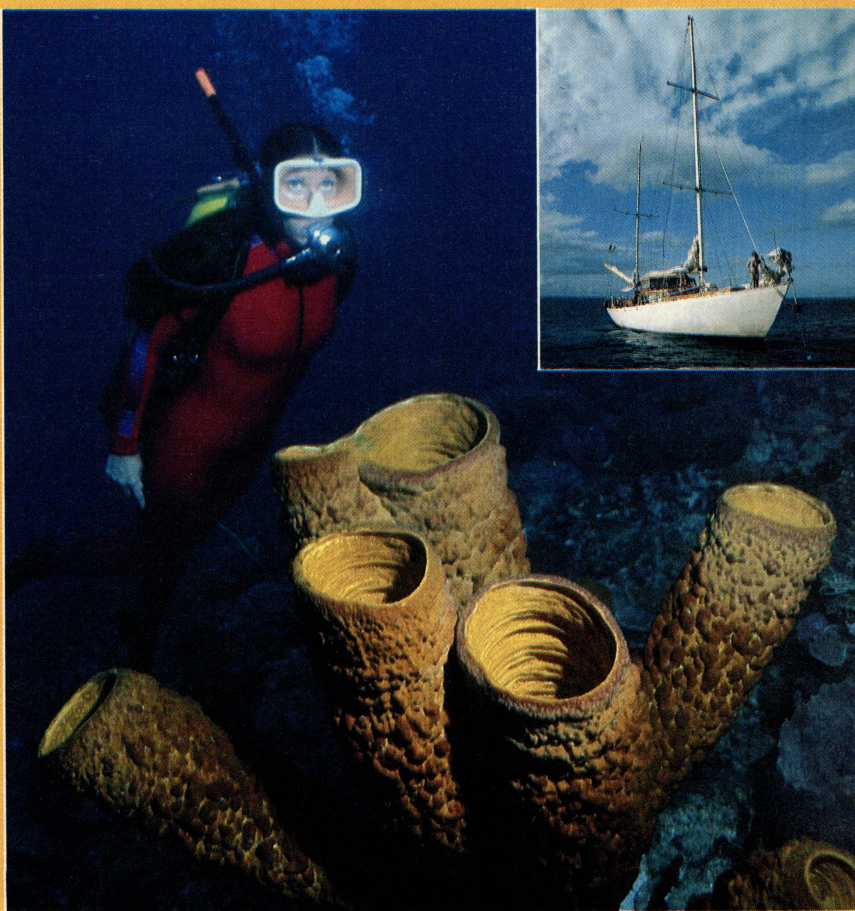
Adventure with the
French Touch
Text and Photography
by Carl Roessler

It is dawn. We are sitting at anchor in a sheltered cove along the western coast of Guadeloupe, in the French Caribbean. The water is still, the air hushed. To the south the volcano, Soufriere, is wreathed in cloud, but in the early sun-glow the rolling hills of the island are darkly verdant.

After a superb breakfast, our host, Dany Guignier, hoists the anchor and we begin a leisurely and lovely sail along the coast. Dany and his wife, Mimi, are the owners of the 56 foot dive boat, *Cadaques*. Ideal for four to six people, this vessel offers private double accommodations, sensational food, and an exciting mix of diving and sailing.

The diving is one of my biggest surprises in recent years. Several years ago I dived reefs off Saba, St. Maarten and St. Lucia without being impressed. What I learned from Dany was that when you know exactly where to look, the reef life and photography can be absolutely mind-blowing.

Dany's one and two week cruises encompass the finest diving on Guadeloupe, Dominica, and (on the two week cruises) Martinique. There are sensational drop-offs off the southern coast of Dominica and for photographers, the fish off Guadeloupe are incredibly tame. There are yellowtail snapper, goatfish, parrotfish, wrasse and even the usually shy hogfish, which come to feed from Dany's hand. Not only are the fish amazingly easy to photograph; the sponges are so varied and colorful as to evoke thoughts of the champion specimens of the Caymans. There



are enormous canary-yellow tube sponges, barrel sponges a diver might sit in, and a marvelous cluster of seemingly snow-capped purple tube sponges that are a delight to photograph.

The *Cadaques* is a graceful, sleek, yet comfortable work of art in mahogany and teak. Small enough to allow quick raising of her sails, big enough to accommodate six in comfort and style with full gear, she is a marvel.

Another marvel is the food. Leave it to the French — in stock in Guadeloupe are fine wines and cheeses and the finest in foodstuffs. Mimi's dinners

don't allow you to lose a pound and Dany has a touch with the morning eggs to suit the fussiest diner.

The week flies by; the sailing, the unlimited diving and the unlimited good food have all taken their toll of time. On our last evening we sit again in a quiet anchorage with thousands of distant suns blazing down at us out of the clear night sky.

For further information on how you can enjoy your own adventure in the French Caribbean, contact See & Sea Travel, 680 Beach St., Suite 340, San Francisco, CA 94109; telephone (415) 771-0077. >

The Caymans

**"If coral drop-offs
are artistic masterpieces,
the Caymans are the Louvre."**

Paul Tzimoulis, Editor, Skin Diver Magazine

But spectacular wall diving, isn't all the Caymans are famous for.

No dive location in the world offers the variety of experiences and conditions for both beginners and experienced divers as the Caymans. And all the dive sites are close by. No long drives or expensive boat trips.

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An hour's flight from Miami on Cayman Airways. A little longer from Houston, Texas.

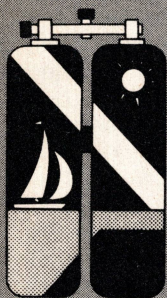
For information and reservations contact your travel agent or write or call: (305) 444-6551.

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SMALL HOPE BAY DOCK

Small Hope Bay Lodge is the oldest scuba diving resort in the Bahamas. Owned by Dick and Rosi Birch, it had been without a dock since Hurricane David consumed the previous one.

The new dock, just completed, is 180 feet long; 12 feet longer and three feet higher than its predecessor. The Birch's son, Jeff, engineered the structure and incorporated a special feature to keep the dock from breaking up in a major storm: the decking is laid in 50 removable sections. Each section can be lifted and moved, leaving only pilings and support beams exposed to any threatening weather.

Over 40 pilings and 3000 board feet of lumber make up the dock. A palm-thatched structure at the end of the dock houses two 15 cfm compressors, scuba gear and guest equipment lockers.

For more information on Small Hope Bay Lodge, write to Dick and Rosi Birch, P.O. Box N1131, Nassau, Bahamas; or call direct (809) 328-2014.

LOOE KEY SANCTUARY

On January 16, 1981 the Office of Coastal Zone Management within NOAA designated Looe Key (southwest of Big Pine Key, Florida) a National Marine Sanctuary. The regulations became effective on April 5, 1981.

Looe Key is well known by divers as a fabulous spur and groove coral system with an abundance of diverse marine life. The purpose of designating this area a sanctuary is . . . to protect and preserve the coral reef ecosystem and other natural resources of the waters at Looe Key.

Some of the activities prohibited in the sanctuary include: removing or damaging natural features (including coral formations); anchoring within the fore reef area; spearfishing; using explosives, poisons or electrical discharges for fishing; and removing or damaging cultural resources (including the cargo of submerged wrecks).

CARIBBEAN GROUP RATES FOR INDIVIDUALS

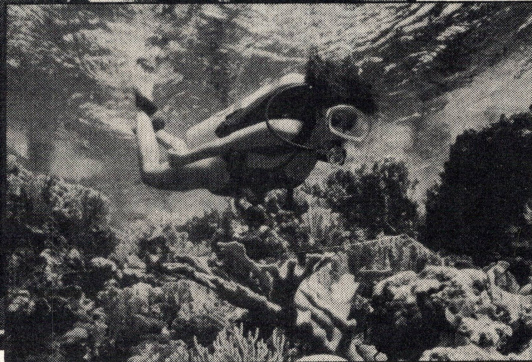
Weekends Away Travel is offering the same per person rates to individuals as for groups on four Caribbean scuba packages through the fall of 1981. Destinations include Tobago, Barbados, Harbour Island, Bahamas and Grand Cayman.

For more information, contact any travel agent or Weekends Away Travel, Inc., P.O. Box 6698, Hollywood, FL 33021; telephone toll-free in the U.S. (800) 327-9543, in Dade County (305) 621-7777 and in Broward County (305) 966-2777.

PETER HUGHES'

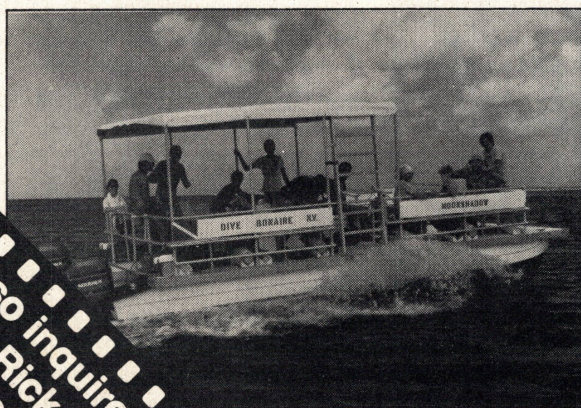
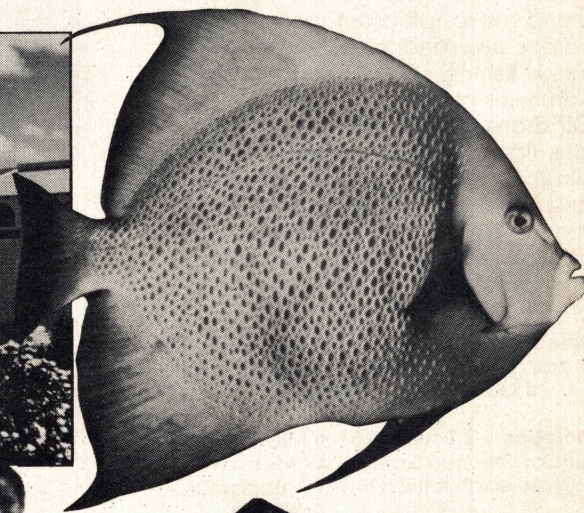
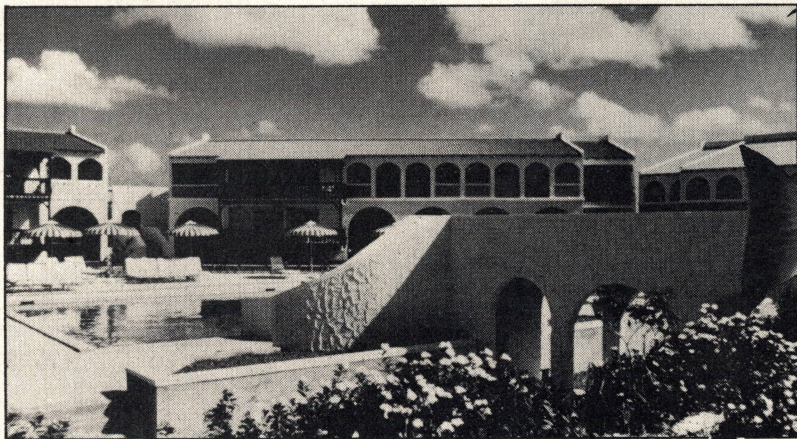
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Peter Hughes
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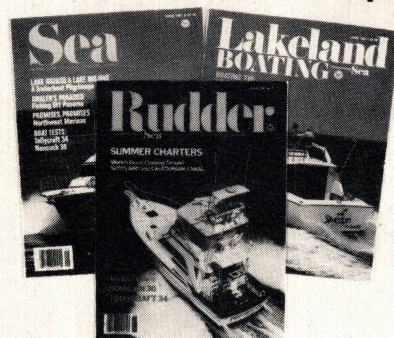
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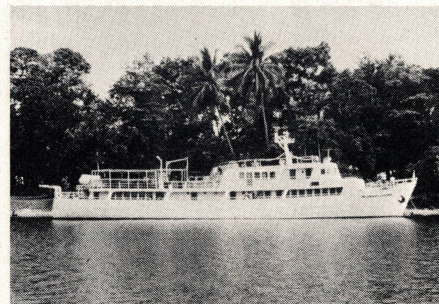
At your local
Newsstand

SEE & SEA TO NEW GUINEA

See & Sea Travel of San Francisco has a new live-aboard dive program in one of the world's most exotic areas, Papua New Guinea.

Carl Roessler, president of See & Sea, will escort the first group departure April 27, 1982. The program will feature diving in the Trobriand, D'Entrecasteaux and other island groups off Papua New Guinea's northern coast.

This adventure will also include a



cruise up the Sepik River, amid the haunts of some of the world's last primitive tribes.

For further information, contact See & Sea Travel, 680 Beach Street, Suite 340, San Francisco, CA 94109; (415) 673-2300.

UNEXSO INSTRUCTOR TRAINING

The Underwater Explorers Society in Freeport, Grand Bahama Island, has stepped up its training program, designed to encourage and assist young Bahamians in becoming NAUI scuba instructors.

In addition to basic and advanced scuba training, the program includes all aspects of working at a dive resort, from assisting on the dives to operation and maintenance of the boats and other equipment.

For more information contact: Underwater Explorers Society, P.O. Box F-2433, Freeport, Grand Bahama; (809) 373-1244.

IMPOSSIBLE DREAM

Divealot Scuba Shop is the West Virginia representative of the *Impossible Dream*. Individuals and groups desiring to book passage on the dive boat may do so by contacting Ray Lambert, general manager of the shop. A discount is available to clubs booking the whole boat through Divealot Scuba Shop.

The *Impossible Dream* is approved for 30 divers. It cruises the Bahamas Islands as well as making special trips to Cay Sal and Eleuthera.

Details may be obtained by contacting Divealot Scuba Shop, Rt. 1, Box 646, Sullivan, WV 25930; telephone (304) 683-4595.

CHUB CAY

BAHAMAS

Just an hour off the Florida coast lies Chub Cay, a slightly luxurious private island... with some of the best diving in all The Bahamas.

On shore, Chub Cay Club offers every amenity for divers... a complete dive shop, dive boats & guides; a luxury yacht club, fine dining and island music; pleasant rooms with a harbor view and sparkling pool. Plus tennis, fishing, sailing and shelling... with miles of beach to roam.

Off shore, superb diving is just 5 minutes from dockside. Plunge 80' over Chub Cay Wall, home of eagle rays and schooling jacks; explore Canyons & Caves, a maze of cuts and caverns, teeming with tropical fish; or snorkel Mama Rhoda Reef, a forest of elkhorn & staghorn corals.

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SKIN DIVER OCTOBER 1981 65

Lying 25 feet below the frigid waters of Maine's Penobscot Bay, encased in a solid mud shroud, is the 16 gun, colonial brig *Defence* — a privateer whose career ended on its maiden voyage. This brig was one of about 30 ships that met the same fate. How did this sleek, 90 foot fighting craft come to such an ignominious end?

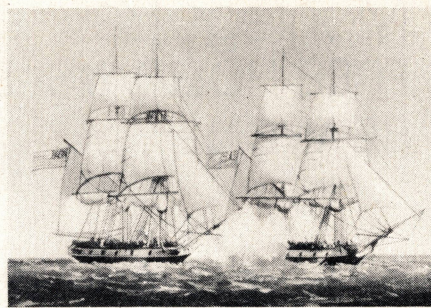
Two hundred years ago on July 24, 1779, a colonial armada consisting of 19 warships and 24 transports hove to in Penobscot Bay. The purpose of the largest naval force mustered during the Revolutionary War was to dislodge an English force that was attempting to establish a naval station and fort on the Castine Peninsula. The British garrison numbered 750 young soldiers, three sloops (mounting 56 cannons) and four transports under the command of Brigadier General Francis McLean, the ablest Crown officer on duty in the colonies. This engagement was called the Penobscot Expedition.

The English had arrived at Castine (then called Majabagaduce — pronounced major bag-a-duce) five weeks earlier and began constructing an earthen fort 250 feet square atop the high ground. The walls were no higher than four feet when the American fleet anchored. General McLean viewed the ship's 350 cannons and their 3000 men as the end to his long military career. His youthful charges, aged between 16 and 18, were without battle experience. Rather than waste their young lives, the general would offer a token resistance, then surrender. Little did he suspect that 21 days hence, total victory would be his with a minimal loss of life. The entire American fleet would be lost — 11 vessels captured without firing a shot in their own defense; the remainder burned. The militia and seamen trekked through the Maine wilderness to their homes in disgrace. Colonel Paul Revere, Colonial artillery commander, would be court-martialed for acts unbecoming an officer and cowardice as was the naval leader, Commodore Dudley Saltonstall.

I became interested in the ill-fated expedition when working on the General Chamberlain Bridge spanning the Penobscot River at Bangor. Four cannons were pulled from the river bottom. They were identified as Revolutionary period Armstrong cannon, later realized to have been aboard the sloop *Providence*, first vessel of the Continental Navy. My search began in 1953 and has not concluded.

Four years of research in six states and three foreign countries gave me a start at learning about a naval disaster equalled only at Pearl Harbor. Although the *Providence* was forever sealed by tons of cement which form a bridge pier, I knew other hulks and artifacts were waiting to be found. Three years and hundreds of diving hours later, the remains of the 32 gun frigate *Warren*, Commodore

The Brig Defence



An Underwater Time Capsule of Major Importance

TEXT AND PHOTOGRAPHY BY JOHN CAYFORD

Saltonstall's flagship, were located. A six pound bronze Massachusetts Revere cannon was recovered — a major find. The next ten years produced two more wrecks, but few artifacts. I wrote of my findings, submitting a copy to the Office of Naval History, Washington, D.C. in 1963. Captain Bill Searle, Chief, Navy Diving Operations, presented a segment of the Penobscot Expedition to the Massachusetts Institute of Technology's Ocean Engineering Department.

M.I.T.'s Summer Lab Afloat uses the facilities of the Maine Maritime Academy at Castine. These students work on projects dealing with the marine field. Employing the research in my Office of Naval History report, the boats from Maine Maritime Academy pulled the magnetometer over the area where I indicated a Revolutionary ship should lie. On the first pass, the "mag" piped a reading. When the side scan sonar was lowered, it showed a nearly intact ship — the 16 gun brig, *Defence*. Water depth at low tide was 25 feet and a thick layer of mud covered the deck. A portion was cleaned away revealing completely filled cannon ball racks lining the railing, cannons double loaded (booby-trapped) and numerous other pieces. It was a beautiful sight to behold. Think of it, being the first human to tread those decks in 193 years.

Defence was a unique vessel insofar as it was on its maiden voyage — having been built the previous year. *Defence* was a paramount discovery — the first Revolutionary craft found in its original condition. How did this ship and 29 others go to the bottom of Penobscot River?

It was impossible to believe that the colonial armada and militia force would not have disposed of the British quickly. On July 28, Continental marines and colonial militia, under the command of General Peleg Wadsworth, grandfather of poet Henry Wadsworth Longfellow, stormed The Heights — a 200 foot sheer cliff — pushing the Redcoats into their fort. They could not press forward as they would have been caught in the cannon fire from the English ships in the harbor. Numerous councils of war could not in-

duce Comm. Saltonstall and a few privateer captains to destroy the enemy's three sloops. Saltonstall's infamous words were, "I will not send my ships into that damned hellhole." Thus, a stalemate.

Meanwhile, British headquarters in New York received word that their fort was besieged and they immediately dispatched reinforcements — a six ship squadron led by the 64 gun Man-of-War *Raisonable*, Admiral Sir George Collier, commanding. When the help arrived on August 13, Saltonstall ordered his fleet to retreat up the river — "every man for himself." *Defence* slipped into a small inlet behind Brigadier's Island and prepared to sneak out after dark. Unfortunately, she was spotted. Captain Collins of *HMS Camilla* lay off the mouth of the inlet waiting for *Defence* to make her move. Shortly after midnight, Captain Edmonds realized escape was impossible. He ordered his men and stores into the long-boats and blew the ship's powder magazine.

The magazine, beneath the captain's quarters and below the water line, blew a section from the stern and a trough in the soft mud under the ship. She sank rapidly into the mud almost to her decks. When the waters cleared, silt had covered her deck. Her masts had been blown away with the initial explosion, and the *Defence* was almost invisible. She remained such for 193 years.

Defence was built in Salem, Massachusetts and owned by Morris Brown and Andrew Cabot. The brig was 170 tons mounting 16, six pound cannon and carrying a crew of 100 men. She was a trim vessel and commissioned as a privateer. Her captain was Commander John Edmonds, an able seaman and a fine officer. His crew was experienced and Brown and Cabot felt that their investment would turn handsome profits. Shortly after outfitting, *Defence* was impressed for the Penobscot Expedition, her first and last voyage.

Dr. George Bass, president of the American Institute of Nautical Archaeology, dove on *Defence* declaring it to be an underwater time capsule of major his-

(Continued on Page 73)



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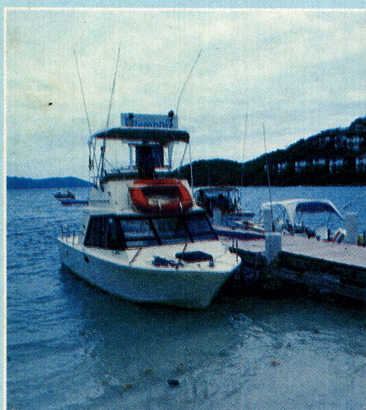
PINEAPPLE BEACH RESORT

Divers are just beginning to discover that in addition to being known as America's Vacation Paradise, St. Thomas is also a diver's dream. Somewhat in the shadow of the island's cruise ship and carnival atmosphere is a splendid underwater environment. Some of the fascinating attractions to be found include a number of first-rate shipwrecks and many outstanding and unusual un-

derwater formations and labyrinths formed during the island's volcanic origin. Complement the environment with U.S. bred resorts, personnel and dive operators and you have a fine dive holiday in the U.S. Virgin Islands.

Twenty minutes from Charlotte Amalie and across the verdant mountain range that cuts St. Thomas in two, you arrive at the Atlantic side of the island. Here,

northsiders will tell you, it is far more beautiful than anything on the Caribbean side. From the heights there are many splendid panoramic views over the Atlantic, of the eastern sweep of the American and British Virgins which appear forest-green against a cobalt sea. The northside has more rain, lush vegetation, and several beaches that are rated among the best in the world.



Dive boats docking right at Pineapple Beach can transport guests to a variety of great dive sites.



Congo Cay, off the north side of St. Thomas, has big fish action including tarpon, barracuda and large amberjacks.

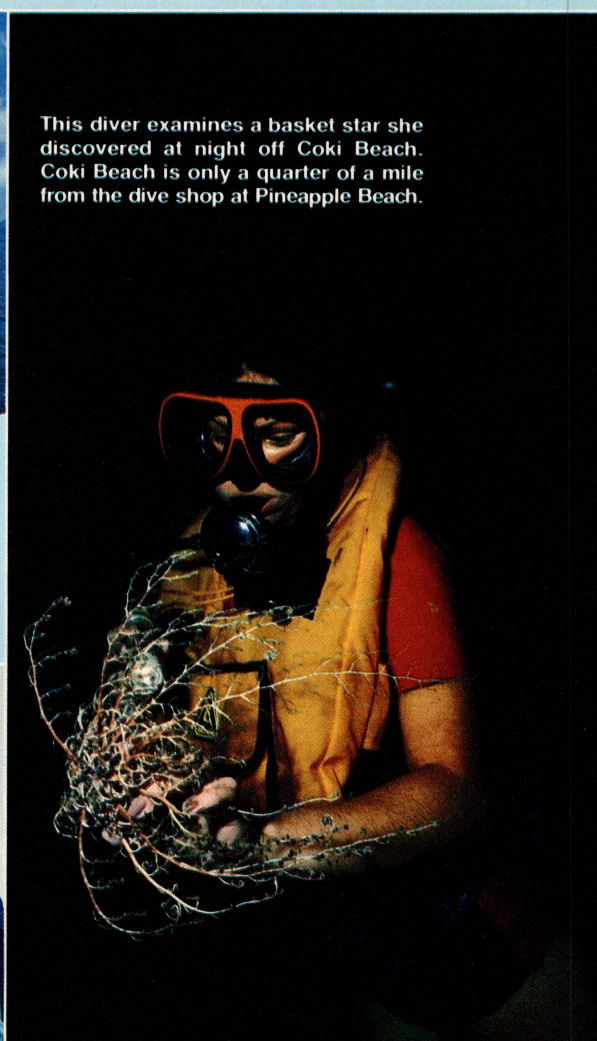
Dome-shaped bungalows below are just one of three styles of lodging available at Pineapple Beach.



Jack Larson, an experienced divemaster, manages the Pineapple Beach dive shop.



This diver examines a basket star she discovered at night off Coki Beach. Coki Beach is only a quarter of a mile from the dive shop at Pineapple Beach.



Blending nicely with this tropical splendor is the spacious Pineapple Beach Resort, occupying 16 acres between hillside and seashore on the northeast corner of St. Thomas. This sprawling complex, owned and operated by the Pepperdine family, is comprised of an original group of dome-shaped concrete bungalows (the cottages), a seaside hotel (the beach wing), and a grouping of condominiums with their own pool (the village). The

specialties and continental cuisine, including a beach snack bar, a poolside lounge and an outdoor pavilion-style restaurant. A complete entertainment program featuring a band five nights a week, along with local steel bands and authentic West Indian shows, is featured. The watersports program is complete and offers sailing, sportfishing, snorkeling or scuba. Tennis is a popular attraction at Pineapple Beach with a resident pro providing instruction on

novice class. This is possible because of the St. Thomas Diving Club satellite right on the Pineapple Beach premises. The St. Thomas Diving Club is not really a club at all but a full service scuba resort network serving many hotels on St. Thomas. By providing professional service, equipment and personnel, the club arranges an impressive self-contained package with five custom boats at three different sites (Villa Olga, Bolongo Bay and Pineapple Beach). This al-

THE OTHER SIDE OF ST. THOMAS BY RICK FREHSEE

condos offer the nicest accommodations, designed with a central studio that can be rented separately or combined with all or part of a four room complex. The outdoor patio-style bungalows with their overhead fans, louvered doors and palm gardens are located closest to the resort's crescent-shaped white sand beach. There is a choice of several restaurants and lounges featuring island

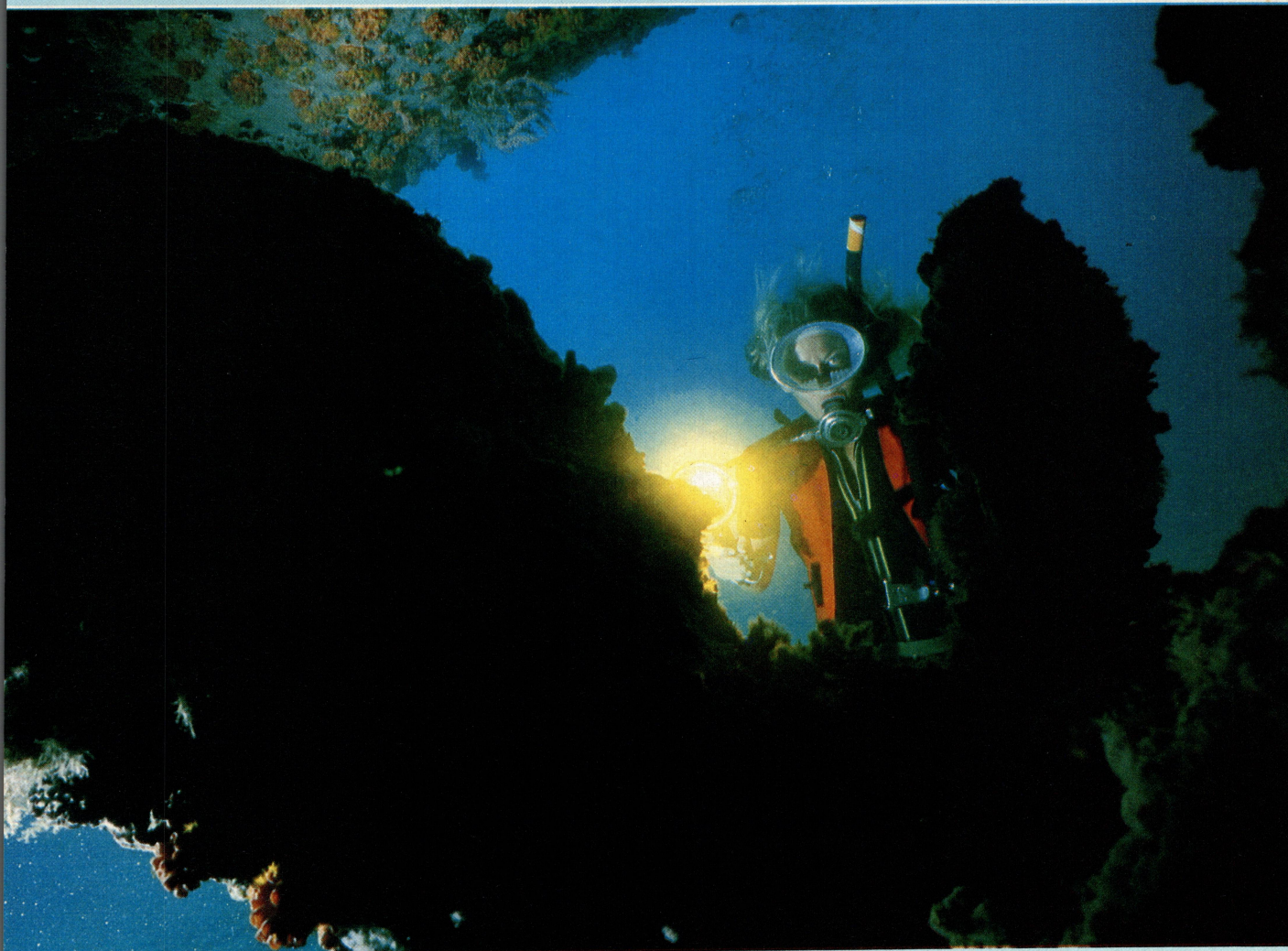
three Har'tru surfaced, lighted tennis courts. To enjoy Charlotte Amalie's lively nightlife and shopping bargains, buses are available several times daily or taxis can pick you up on short notice.

While it may appear that Pineapple Beach tries to provide something for everyone, the dive operation is nevertheless a first class effort and caters to very experienced divers as well as the

novice diver. This is possible because of the St. Thomas Diving Club satellite right on the Pineapple Beach premises. The St. Thomas Diving Club is not really a club at all but a full service scuba resort network serving many hotels on St. Thomas. By providing professional service, equipment and personnel, the club arranges an impressive self-contained package with five custom boats at three different sites (Villa Olga, Bolongo Bay and Pineapple Beach). This al-

lows a diver to stay at one hotel and dive many different sites on either side of the island. The Pineapple Beach dive center is housed in a new building on the northern end of the resort beach and is stocked with a heavy-duty compressor and the latest in dive gear. The director of operations is Jack Larson, a recent transplant from Marathon in the Florida Keys.

The huge propeller of the *General Rogers* is heavily encrusted with hard corals, colorful sponges, featherdusters and gorgonians.



photo/Geri Murphy

St. Thomas

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I got to know Jack in the Keys and was delighted to see him again at Pineapple Beach. Quick to smile, Jack is an intelligent, articulate and experienced dive-master who is a good dive and social companion. Andre Weber, his able assistant, has worked at the Pineapple Beach operation for almost a year and has a fine reputation as a hospitable divemaster.

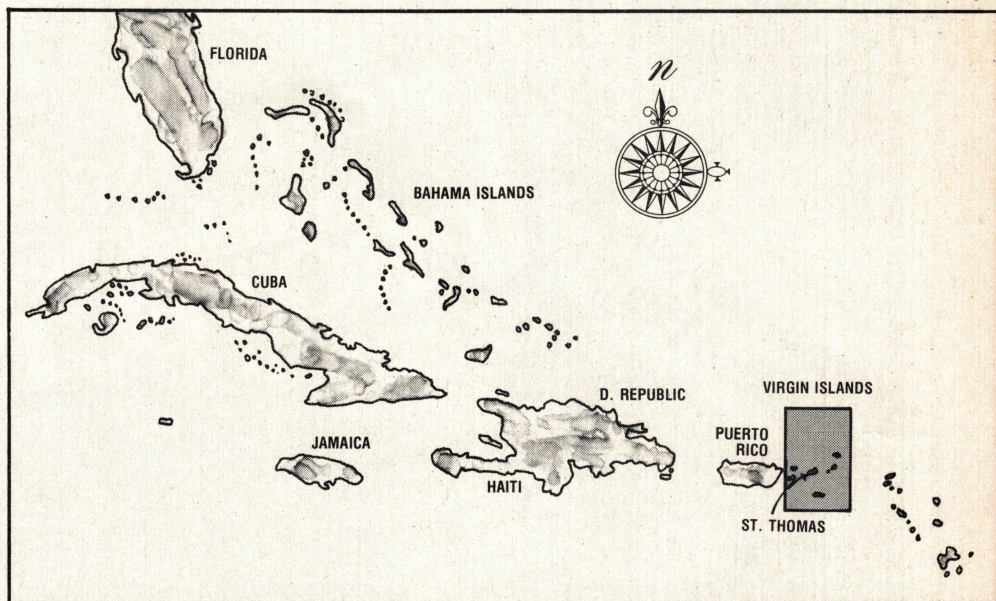
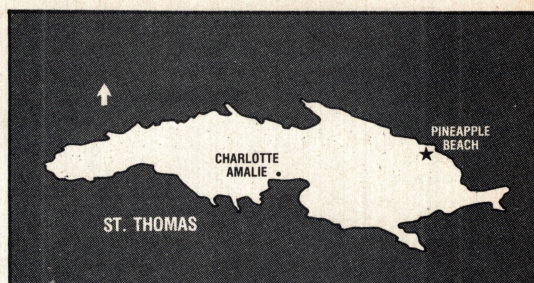
One of the greatest assets to the resort's location is nearby Coki Beach, a scenic delight which offers convenient and easy beach diving. Only a quarter of a mile from the dive shop, Coki offers a sloping bottom covered with seaweeds and dome corals with some nice elkhorn formations in the shallows. Depths are good to about 50 feet which, owing to the angle of the reef slope, is a short distance from shore.

Coki Beach graduates and experienced divers can look forward to charter trips aboard the *Diver II*, a 25 foot Delta custom dive boat. From the dock at Pineapple Beach you can quickly reach a number of offshore islands and submerged pinnacles on the north side of St. Thomas which are quite different from the sites available on the southern side. The prehistoric upheaval that produced these islands also created a fascinating jumble of giant boulders and unique formations below water. In the shallows, waves and currents have fashioned caves and tunnels which are unlike the coral caves usually found throughout the Caribbean. And with the Atlantic deep close by, a host of pelagic fish are frequently seen.

Thatch Cay is an offshore island directly out from Coki Beach which offers one of the most unusual dive sites on St. Thomas. The Caves of Thatch are a series of natural stone tunnels and underwater passageways that cut through the western tip of the island like holes in swiss cheese. Just below the surface in only 15 feet of water is a conglomeration of huge boulders and smooth vertical walls. Above are hundreds of silver pilchards playing in the rolling clouds of surf and turbulent sea foam striking the stony wall. The entrance to one of the main tunnels is very shallow and the floor of this rocky channel is only about 20 feet deep. Divers usually enter in single file with their movements synchronized with the surge.

Perhaps the most amazing aspect of these tunnels is the display of dazzling colors offered by the corals and sponges that cover the walls. The reds, oranges, purples and greens of the encrusting organisms are punctuated with larger forms of lavender, yellow and blue tube sponges. Here is a kaleidoscope of colors and shapes, unique to the Virgin Islands, that will satisfy the most jaded

Below, St. Thomas is the busiest of the U.S. Virgin Islands. Its south shore faces the Caribbean while the north side meets the open Atlantic. Right, Pineapple Beach lies on the Atlantic side of St. Thomas, about 20 minutes over the mountains from Charlotte Amalie, the capital of the USVI.



close-up photographer.

Sunk in the channel between Thatch Cay and Pineapple Beach is the wreck of the *General Rogers*. This 120 foot steel hulled Coast Guard vessel was intentionally sunk as an artificial reef in 70 feet of water. The ship's hull is a vertical wall of corals, colorful sponges, featherdusters and clusters of bright to deep purple tunicates. These beautiful colonial organisms look like a floral bouquet and are a feature attraction of northside diving.

Congo Cay is one of the most dramatic northside dive sites. On the inside of the island, in 45 feet of water, is a lovely isolated coral head. It rises off the flat sand bottom in a mushroom formation, attracting a large population of silvery fry which graze above it like insects attracted to a night light.

Seaward of the western tip of Congo Cay is a rapidly sloping drop-off that runs from 10 to 90 feet. This area may be subject to a heavy current and should be explored by experienced divers only. Here the offshore island kisses the deep Atlantic and schooling tarpon, barracuda and large amberjacks are often encountered.

Many divers say that the best dive spot on the northside is found at Carval Rocks, a stony pinnacle that breaks the surface just east of Congo Cay. Starting right at the surface, a rocky drop-off de-

scends steeply to 90 feet. The reef slope is heavy in dome corals and is festooned by a field of giant frothy seaweeds, large gorgonian fans, and tube sponges.

Further down the reef slope it is common to find barracuda, large jacks, schools of snapper and many kinds of reef fish. This is also a good place to find more southern stingrays and those most graceful of ocean creatures, the manta ray and the spotted eagle ray. The reef slope here is a wild dive but the frequent currents are best handled by experienced divers in good physical condition.

There is a spot at Carval Rocks in 20 to 30 feet of water where a magnificent school of silvery tarpon are frequently found. In an underwater pass that runs from the shallows to the reef slope the tarpon tread in a mild current watching a school of fry. I have counted over 40 tarpon at Carval Rocks and I have always found three or four hiding in the pass.

Pineapple Beach and the St. Thomas Dive Club offer a complete eight day/seven night package with 12 dives, priced for single or double occupancy. A special 18 dive package is available for groups of 12 or more.

For information phone (809) 774-1376 or write P.O. Box 4976, St. Thomas, USVI 00801. For reservations only, you may phone toll free (800) 524-7940.

2 men shot dead

A 27-year-old Hawthorne man and an unidentified 61-year-old man, whose identity was being withheld, were shot and killed this weekend in unrelated incidents.

The man, who was

Woman and Son, 8, Found Stabbed to Death in

A woman and her young son were found Thursday in their locked car. The victims were identified as Detective Lt. 8, her son, Mitchell, 8, and a neighbor who was investigating the case. The woman was found in the back seat of the car, and the boy was found in the front seat. They were both stabbed to death. The car was found in a parking lot near a beach. The woman was a 35-year-old mother of three. The boy was 8 years old. The car was a 1980s model. The police are looking for anyone who saw the car or the victims. The case is being treated as a homicide.

They stole the woman's purse — and then her husband's life

Rayburn was always friendly when he met a hard-core Long Beach

Four Found Slain in Laurel Home

could depend on her to pick her up after the time

at makes his older brother a New York City resident. People was a

Staten Island the reason the duration of the retired

women were a woman seen in a car on Wednesday in a far from the

ing Crime More Violent Report Finds

South gangs are committing increasingly violent crimes in Southern California appears to be the hardest hit, according to a report released Tuesday by the Department of Justice.

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Man, 2 Boys A of String of Burglaries

The story was in Charles Dickens' "Oliver Twist" with a Faginlike leader who showed all the crime to the Artful Dodger. The locale was Santa Monica in the last three years rather than Victorian London, and the crimes were burglaries instead of pickpocketing.

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The police said all the dead when Fire Department medics arrived at the stucco house in the neighborhood of Wonderland Avenue.

THE BRIG DEFENCE

(Continued from Page 66)

torical importance. The ship would be AINA's first New World project. A consortium formed with AINA providing operational supervision and professional expertise relating to the specialized technology of underwater archaeology, search and recovery. Dr. David Switzer, AINA representative, works with Maine Maritime Academy's Professor David Wyman, ocean engineer. The Maritime Academy is the second member of the consortium providing field support, faculty, equipment and facilities. The last member is the Maine State Museum that provides a museum conservator for the registration, preservation and the future use of the recovered materials. The consortium is assisted financially by the National Endowment for the Arts, the National Endowment for the Humanities, the Maine Historic Preservation Commission and the National Geographic Society. The salvage program was named: Project: Heritage Restored.

The work on *Defence* presents a new field of study and treatment to preserve water deteriorated artifacts. The ship's artifacts have considerable degradation from erosion, oxidation, electrolysis and numerous organisms. The Maine State Museum has established a special conservation laboratory to test preservation techniques and to preserve the brig's valuable artifacts.

Two iron cannons plus cannon balls were recovered and sent to the Naval Research and Development Center, Annapolis, Maryland, for initial preservation studies. One cannon was found to be booby-trapped and moved to the Naval Ordnance Depot for disarming. Strangely enough, the charge was still able to be fired. It was removed and treated. The preservation process took 18 months.

Work on the *Defence* begins with an hour boat trip from the Maritime Academy across Penobscot Bay to Stockton Harbor. The average water temperature is 45°F with visibility about four feet. On the dive platform, the crew lowers a 25 foot square plastic grid with five foot squares over the fore peak. Each square is marked so the artifacts can be placed in a specific part of the vessel by the sketcher topside. The museum conservator marks each item with a registry number and its exact location is noted on an overlay drawing. Ocean engineer Dave Wyman takes the hull measurements from the divers producing a triangulation of structural ship parts and an overall blueprint.

A four inch air lift starts sucking the overburden into a sieve. The barge staff cleans the personal artifacts collected by the lift. Shoes — with buckles in place, wood, leather and metal buttons, pewter spoons, and monogrammed wash buckets are among the interesting items being recovered from the crew's quarters. One

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THE BRIG DEFENCE

metal button has U.S.A. stamped on it —
probably from the uniform of a Continental
marine.

The divers located the cook stove with
its brick hearth and large sectioned copper
cauldron. Each brick was marked, re-
moved, treated and reassembled. The
stump of the main mast was released and
when the divers prepared to take it to the
surface, to their surprise, it floated. The
work is slow, methodical and very exact-
ing. Yet, each day produces more excit-
ing bits and pieces of 18th century sealife
from the clay T.D. pipes which they
smoked to the beautiful cobalt bottles
from which they drank their rum. When
the crew's quarters were cleaned, it was
impossible to understand how so many
men could live in so small a space. Re-
search revealed the term "hot bunks." When
half the crew was on duty, the re-
mainder slept. Bunks did not have time to
lose the body heat of one occupant be-
fore another slipped into it.

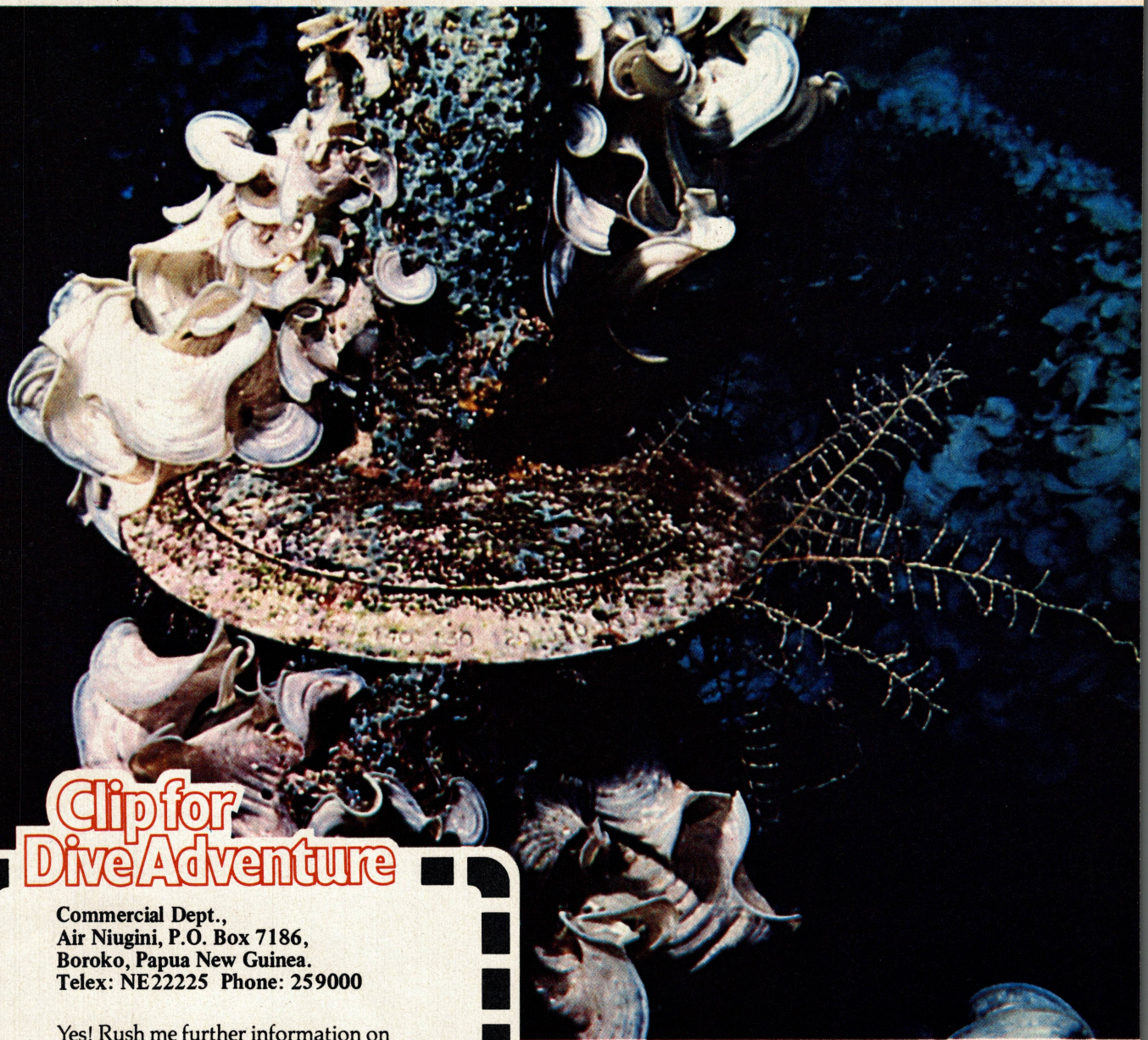
It has always been understood that our
Revolutionary period vessels were de-
signed and built very similar to those of
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from *Defence's* hull are proving a far dif-
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neuverability and speed which would cer-
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Paul Revere, the British commanding of-
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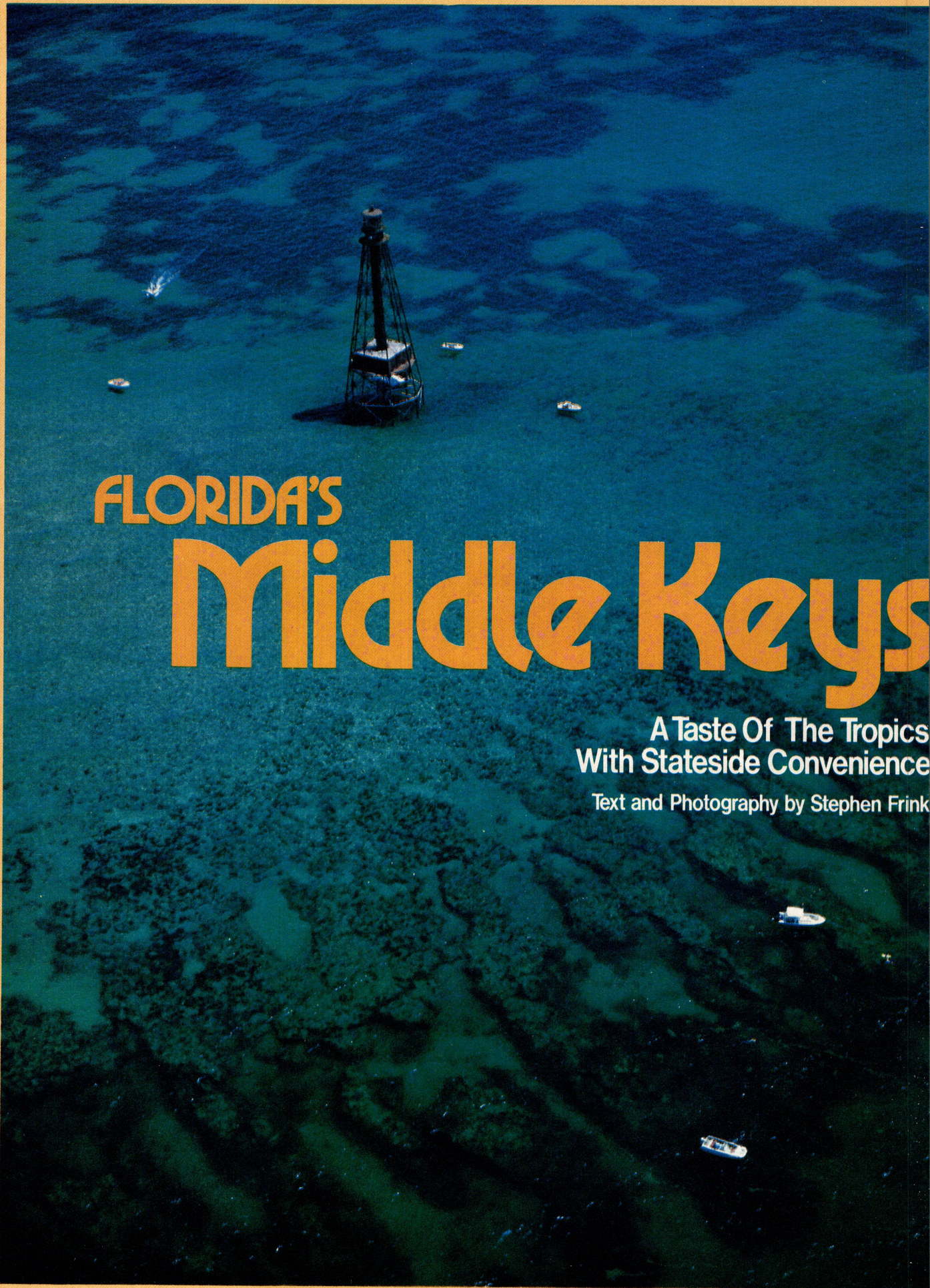
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An aerial photograph of a coral reef in turquoise water. A lighthouse stands on a small patch of land in the upper center. Several small boats are scattered across the water. The text 'FLORIDA'S Middle Keys' is overlaid in orange.

FLORIDA'S Middle Keys

A Taste Of The Tropics
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Text and Photography by Stephen Frink

The aerial view of the Florida Keys establishes a perspective that even residents tend to miss. From the air we see a concrete ribbon, U.S. 1, and more than 200 small islands, called keys. These are variable in size, but each of the larger islands has houses dotting man-made canals, condominium complexes and shopping centers. Mangrove trees fringe the land mass. To the west is the vastness of the Florida Bay, to the east, the enchanting emerald green of the Atlantic Ocean. Even from 5000 feet you can see that these are people tied to their ocean. Boats, marinas and dockage areas abound. Propeller tracks scar the shallows. Charter fishing boats cruise the Gulf Stream and back country. Coral formations are abundant everywhere on the Atlantic side, and frequently one sees the various commercial and private craft sporting the familiar red and white divers' flag. Obviously this is dive country. It includes our nation's only living coral reef, and in the Middle Keys a sophisticated industry has evolved to service this natural resource.

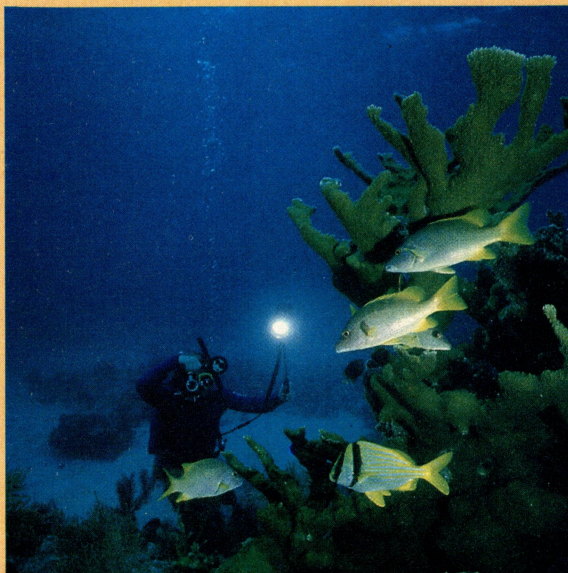
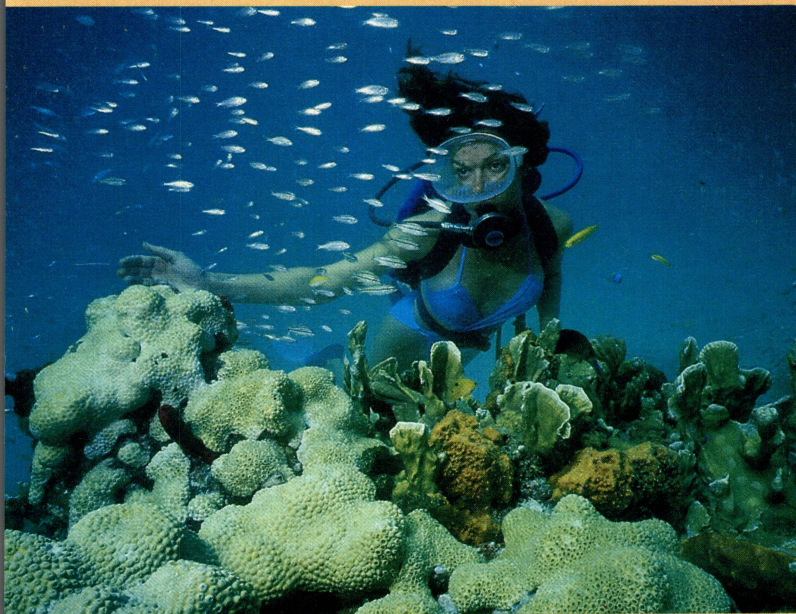
Marathon is the major population center for the Middle Keys and as such offers excellent restaurants, hardware stores, a movie house, service stations, supermarkets and various degrees of luxury in accommodations. The municipal airport has a 5000 foot runway and is serviced by two airlines, Air Florida and PBA. Since deregulation of the airlines, competition has brought air fares down to a point where (at this writing) it costs only \$24 to fly from Miami. Of course, along with the airport there are various support industries such as taxicabs and rental cars. All of this relatively supplemental to the diving tourist, however. A person planning dive travel really needs to be concerned with two fundamental questions: Is the diving good, and are the operations servicing the area competent? In the Middle Keys, the answer to both questions is a definite yes.

Middle Keys diving is undergoing a subtle change these days. Years ago coral collecting was permitted and the reef was viewed as an inexhaustible resource. On my recent trip to research this article I encountered a stand of pillar

coral that was quite impressive: the coral heads stood eight feet tall. I commented to my host that, given the fragility of pillar coral, he must be quite proud of this beautiful reef structure. "Yeah," he said, "but you should have seen it in the old days." It was only eight years ago (and residents still remember the day) a boat came in, broke the largest coral heads off at the base, and transported them to a roadside shop to sell. It was legal and this was the man's business. . .

Today coral collecting is illegal and Middle Keys dive operators are proud that their efforts helped to bring about the legislation that made it thus. Shelling is permitted, in fact encouraged by many operations, so that their customers may go home with a souvenir of their dives. However, most operators recommend that shells with living animals inside be left in the ocean, and any goodie bags with coral of any sort are inspected and illegal contents returned to the sea.

Spearfishing is a popular activity for many divers visiting the Middle Keys. Most members of the dive business community don't see any reason why their



Sombrero Reef (opposite page) is the most visible of the Middle Keys reefs as it is marked by a 140 foot lighted tower. A multitude of coral forms and flamboyant reef fish inhabit the waters of the Middle Keys.

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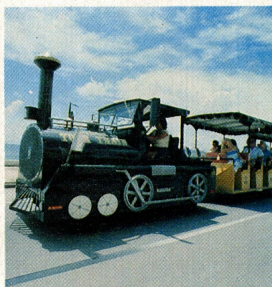
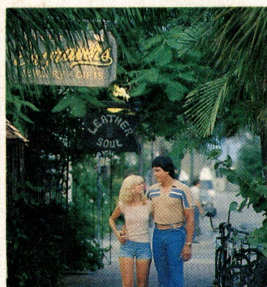
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MIDDLE KEYS

customers should be denied the right to provide fish for their own dinner table. Realistically, what difference does it make whether you go out and spear a fish or buy it in a market or restaurant? The net result is one dead fish and one full stomach. The problem occurs when the spearfisherman is either unaware of what fishes are edible, or even worse, is indifferent. The dive operators in the Middle Keys seem to contend that spearfishing is a viable sporting activity, but are adamant in their feelings that restraint should be exercised. For the most part, dive trips to accommodate spearfishermen go to the deeper, less heavily dived reefs, and boat captains do their best to brief their customers as to which fish are fair game. As much as is possible, conservation is endorsed. These people would not be in the dive business if they did not first love the ocean and they could not stay in the business if they didn't try to preserve the finite resource that comprises their livelihood. Still, they greet the obvious trend away from spearfishing and toward underwater photography with great satisfaction.

In at least one area of the Middle Keys, however, dive operators no longer have the total burden of enforcing conservation beliefs. In his last day in office, Jimmy Carter signed the legislation which made Looe Key, John Pennekamp Coral Reef State Park, the *Monitor*, and certain California Channel Islands, National Marine Sanctuaries. While the area is protected as of January 16, 1981, there are still some organizational difficulties regarding the responsibilities of enforcement. For now, the Marine Patrol and the Coast Guard are both patrolling the waters of Looe Key, but ultimately on-site management will be the job of the Department of Natural Resources. In all probability, fish trapping will be banned, but lobstering in season permitted. It will be illegal to anchor in the coral and violators will be cited. This will be especially rigidly enforced in the inner core area (approximately 800 meters by 300 meters) where the bulk of the most magnificent corals are. Spearfishing obviously will be prohibited, but if controls follow the precedent established in Pennekamp Park, it will be legal to fish from a boat with a line. Dive shops in the Marathon/Big Pine Key area will be your best reference regarding the legalities of diving Looe Key.

Much has been written regarding the specific dive sites along the Middle Keys and the diversity of this reef structure is invariably mentioned. Depths range from 3 to 120 feet among the reefs regularly visited by the dive boats. Over 40 spe-

cies of shallow water corals are evident in Looe Key alone and I can't begin to estimate the number of different species of fish and invertebrates indigenous to these waters. Some of the reefs exhibit the spur and groove configuration, some are patches of coral heads, and in some areas ledges are the most predominant. On the deeper reefs huge barrel sponges abound.

Coffin's Patch — This area is actually six distinct reef structures. While there is considerable overlap in species of coral, each area seems to have a dominant species. For example, one area is thick with magnificent pillar coral. It is so beautiful now, I have difficulty imagining what it was like before the harvest eight years ago. Depths here generally range from 15 to 25 feet.

Delta Shoals — Maximum depth here is about 30 feet and the most abundant corals are brain, staghorn, elkhorn and star. Most of the marine life can be found within snorkeling depths, and several

wrecks can be found within this area. On the deeper side of these reefs, beginning in about 50 feet of water, is an older reef comprised of deep water corals and sponges. Here depths in excess of 100 feet may be obtained. Check with your Middle Keys dive shop for further information and scheduling details.

Sombrero Reef — Sombrero is the most visible of all Middle Keys reefs because it is marked by a 140 foot lighted tower. Therefore, it receives relatively heavy diver traffic. The coral reefs here are very definitely a well-developed spur and groove system.

Looe Key — This is not a key at all since the sand spot which comprised it was washed away by a hurricane approximately 150 years ago. The area is now a coral reef approximately six and one-half miles southeast of Big Pine Key. Operators on Big Pine Key run to this area on a regular basis (for most boats this takes approximately 25 minutes). Most of the Marathon operators run to Looe Key as well, however time from dock to reef is understandably longer. Depths range from 2 to 40 feet in the core reef section. Approximately 200 yards seaward there is a drop-off that goes from 50 to 90 feet.

This is not intended as a comprehensive description of every dive site in the Middle Keys. There are too many, the local dive operators can describe them better than I, and part of the joy of diving is discovery, anyway. The point is that there is plenty of varied diving to be found, and the dive shops seem to keep things fresh by diving them all. The area is extremely well established in terms of serving the diver/tourist. The boats are first class, and surface support facilities (as elsewhere in the Keys) are excellent. All levels of instruction, from resort course to instructor, are available; scuba equipment and camera rentals are found in nearly every shop; and a wide selection of modern retail gear is maintained.

Certain times of year visibility is in excess of 100 feet. But, at other times the tides and currents will sweep in the dirty water from the bay side and visibility can drop dramatically. Sometimes the Gulf Stream will sweep in close to shore and cleanse the reef, and sometimes the water stands still and the plankton bloom lowers visibility. Temperature on the reef ranges from 68°F in the winter to 88°F in the summer. Conditions are continuously variable, but the overall impression of a Middle Keys dive vacation is very favorable. There is something for everyone, and the service provided by the dive shops is certainly professional. Most shops are either connected with resorts or are working with various motels in the area, so that one call should firm up both diving and lodging arrangements. The dive operators I've spoken with in the Middle Keys contend that their diver traffic is nearly 75 percent repeat business, and that is as good a recommendation as any business can ask. 

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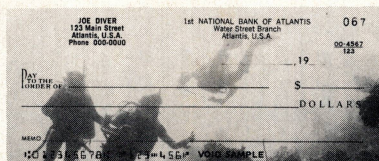
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Gerry Jones is the new co-owner and skipper of the *Cayman Diver*, the live-aboard dive boat that takes visiting divers to every corner of the Cayman Island diving world. The 83 foot *Cayman Diver*, which specializes in week-long trips to the reefs of Cayman, has undergone a wide-ranging overhaul and refurbishing.



The *Cayman Diver* has a capacity of 12 divers and a crew of six. Tanks, backpacks and weightbelts are furnished. There are two Mako compressors and a full galley with, "some of the best turtle and fish dinners in the Caribbean," according to Jones.

Originally a Coast Guard craft, the *Cayman Diver* was brought to the islands in 1970 by Bob Soto. She was later purchased by Paul Humann, who skippered her until she was sold to Jones. The *Cayman Diver* is booked exclusively through See and Sea Travel Service.

USVI TOURISM DIRECTOR

Robert Martinez has been appointed Miami regional director of the U.S. Virgin Islands-Division of Tourism. Martinez will



be responsible for all sales and promotional activities in the southeastern United States. Prior to his transfer, Martinez managed the Chicago office.

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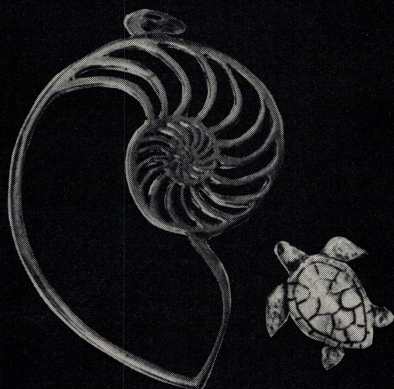
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Tom Van 't Hof, director of STINAPA, told SKIN DIVER: "The existence of the



permanent moorings and the willingness to use them emphasize the concern for the reef shared by Bonaire's people as well as its dive operators."

A control site along Bonaire's coast was moored by STINAPA, too. This site is used by STINAPA biologists to compare reefs which are heavily dived to one that is not dived recreationally at all. ➤

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Because of Qantas' new direct service, Dive In Australia is now able to offer more attractively priced dive tours to both the Great Barrier Reef and the Coral Sea. For more information and brochures contact: David Loughnan, Dive In Australia, P.O. Box 1111, North Sydney, 2060, Australia; or Qantas Airways, 360 Post St., San Francisco, CA 94108. ➤

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Dick and Rosi Birch, owners of Small Hope Bay Lodge on Andros Island in the Bahamas, have added two new divemasters to their scuba program. Mike and Sallie Francis, from San Luis Obispo,



Back row (L to R), Dick Birch and Brendal Stevens. Front, Mike and Sallie Francis.

California, have joined Brendal Stevens in this capacity.

Mike has been an active NAUI instructor for 16 years. Sallie, a NAUI divemaster, has been assisting with scuba courses for nine years. Both are underwater photographers.

Small Hope Bay Lodge was built over 20 years ago by Dick Birch and was the first dive resort established in the Bahamas. The lodge has developed a reputation for wall diving along the 142 mile Andros Reef, which drops off into the 6000 foot deep Tongue of the Ocean. Wreck diving, dives in coral caverns, shallow coral reef, night and drift diving are offered from three flattop dive boats.

Small Hope Bay Lodge has limited itself to 20 guest cabins along the beach.

For more information, write airmail to: Small Hope Bay Lodge, P.O. Box N1131, Nassau, Bahamas or phone toll free (800) 327-3139; direct (809) 328-2014.

HYTHA TO HOTEL BOARD

Gerry Hytha, proprietor of Grand Cayman's popular Cayman Diving Lodge, has been named to the board of the Cayman Islands Hotel Association.

Hytha came to Grand Cayman two years ago, when, after producing a film for the Cayman Islands Department of Tourism, he purchased Bob Soto's East End Dive Lodge.

WATERSPORTS PACKAGE

All new four day/three night and seven day/six night Water Sports Holiday packages to Casa de Campo Hotel, Villas and Country Club are available now through December 15.

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The Dive Shop at Akumal carries a complete line of scuba and snorkeling equipment for sale or rent. Diving instruction can also be arranged.

For more information contact: Dick Blanchard, Postal 984, Cancun, Q.R., Mexico. You can telephone Dick at 30106 Cancun, but allow three days for return calls. ✉

BONAIRE TOURIST OFFICE

The Bonaire (Netherlands Antilles) Tourist Information Office has moved to larger quarters at 1466 Broadway, Suite 903, New York, NY 10036. The new telephone number is (212) 869-2004. Cable address is NYBontour. ✉

PIRATES WEEK

Divers be warned: the isles of Cayman will be a veritable treasure trove October 24-31 this year. That's the date of Cayman's national festival, Pirates Week, which includes an underwater treasure hunt for divers. Each year, "gold" doubloons are buried in the reefs and sands of Cayman's crystal waters, in a specific area up to a maximum depth of 50 feet. The doubloons have a number on them which relates to a prize: this year, a range of basic dive gear, trips, gift vouchers and dinners for two will be presented.

The treasure hunt will be in two sections, one for scuba and the other for competent snorkelers. Each group will have a maximum one hour search time. Entry fee is \$12.50 per person and everyone initially receives a small gift.

Organizing this year's hunt again is PADI/NAUI instructor Stuart Freeman.

Last year 147 divers entered and 100 prizes were given. This time, hunt organizers are expecting 200 divers and a comparatively higher number of prizes.

The treasure hunt is scheduled for October 25, the first Sunday during Pirates Week. ✉

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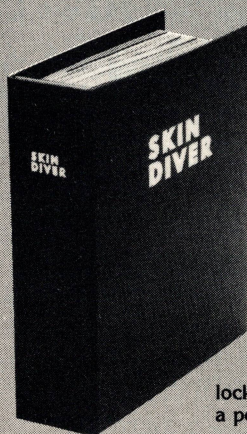
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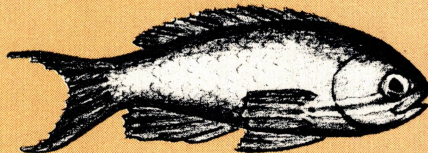
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The Goldfish

(*Anthias squamipinnis*)

The goldfish, sometimes called the sea goldfish, is one of the most common schooling reef fishes of the Red Sea. Hundreds, even thousands, of them can be seen in giant orange clouds over isolated corals. It is a relatively deep-water reef fish found throughout the central, tropical Indo-Pacific; the Maldives being a chief location, the Gulfs of Aqaba and Suez are others. It is a brightly colored fish — orange, yellow, red and pink — the colors changing with age and sometimes diet. The fish is tiny, the maximum size being about four inches. □ There are a good number of fishes in the oceans of the world that change sex with age and the goldfish is one of these. All goldfishes are born as females — small and orange — and grow into males later in life — red and reddish purple with yellow and bright pink markings. The older male goldfish has an elongated dorsal spine that trails out into a filament and the upper and lower lobes of the tail elongate into filamentous fins. This particular characteristic is one reason for the common name used for the fish by Dr. Herbert Axelrod — lyretail coralfish. The tail of the younger fish is deeply forked or crescent shaped, but without the long lobes. □ The sex reversal phenomenon of the goldfish was studied in length by the Israeli ichthyologist, Lev Fishelson, who determined that in a large group of *A. squamipinnis* containing hundreds of thousands of individuals, 80 to 90 percent of the fishes would be sub-adult and adult females with only a few of them active, territorial males. The scientist isolated a female-only group of 20 fishes and within a week one of the females became male. The male was removed and soon afterward an-



other female became male. The procedure was repeated until at the end of one year all 20 fishes had become male. The scientist surmised that the transformation took place only if there was a reproductive need for males. □ The goldfish has been grouped into the Serranidae family of groupers and basses by some ichthyologists (Axelrod), but most of the literature refers to the Anthiidae family of goldfishes as being a separate family of its own. Groupers are sex changers, and they have rather large mouths and large ctenoid scales. Anthids are small fishes with comparatively big mouths and they are sex changers, and these reflect the typical Serranidae characteristics. However, the anthids for the most part are considered separately. □ *Squamipinnis* means scaly-fin and this is in reference to the fin scales of the goldfish. The single dorsal fin is continuous to slightly notched and the third dorsal

spine is the one that elongates into a filament as the fish becomes an older male. *A. squamipinnis* is the most common of the Anthiidae, and the most well known of the species where it occurs. Several of the Anthiidae, including the young *A. squamipinnis*, have an orange to reddish streak extending from below the eye to the base of the pectoral fin. □ The goldfish is a shy fish, usually staying within its protective school or in the cracks and ledges of a deep-water reef. It disappears quickly when frightened. Its diet consists mainly of miniature invertebrates — copepods, amphipods, shrimps — which it feeds on by day. The fish is highly prized among aquarists but in captivity it can lose its bright color. Axelrod states that it can be kept orange by heavy feedings of brine shrimp. ➤

Photo By Chris Newbert - Text By Hillary Hauser

Chris Newbert took the photograph in the Red Sea. He used a Canon F-1, with a 50 mm macro lens, in a Farallon/Oceanic Hydro 35 and Farallon/Oceanic 2003 strobe. Kodachrome 25 film, f16, 10 inches from subject.



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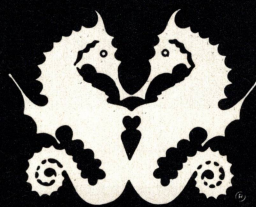
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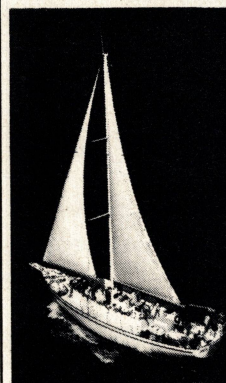
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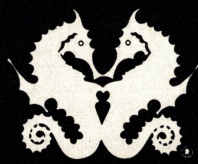
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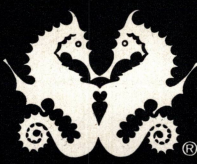
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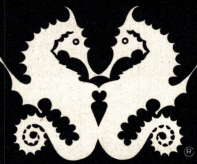
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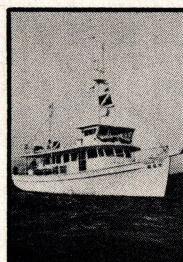
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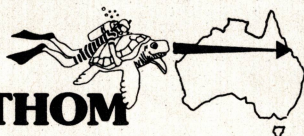


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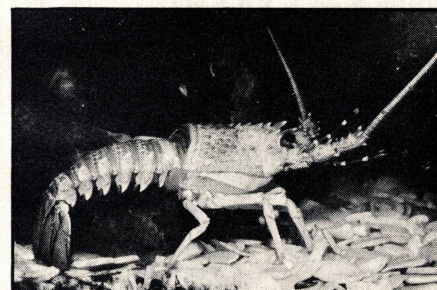
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Text and Photography

Crustaceans — a classification that includes crabs, shrimps, lobsters and crayfish — all have a hard shell or exoskeleton, which does not grow. The only way in which a crayfish (spiny lobster) can attain a size suitable for a candlelight dinner for two, is to climb out of its old, tight fitting shell, and in just a few hours, do some very fast growing before its pliable new skin hardens into a bright spikey suit of armor.

The frequency of molting varies with different species of crustaceans around the world, but the New Zealand crayfish (*Jasus edwardsii*) goes through the process once or twice a year. If you think



this looks easy, try the same thing yourself. It's hard enough getting out of a wet-suit the conventional way, but try keeping your hands and feet firmly planted on the deck and wriggling out through a slit in the small of the back — impossible? The crayfish has more spikes, knobs, joints and hinges than even the oddest shaped

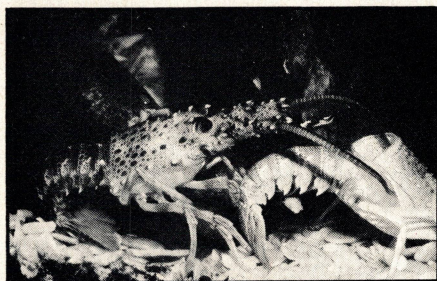
SCENE

by Roger W. Elliot

diver and yet makes it look easy.

The system has its advantages and problems. Repairs to old wounds are no trouble at all, even new legs or feelers can be added to replace lost ones. Unfortunately, during the soft stage the defenseless crayfish is the favorite menu item for a large variety of predators.

Molting takes up to half an hour, although the latter stages happen very rapidly. The crayfish frees the spikes on its tail by undulating the tail, allowing water to enter the now split junction between tail and head. The process is rather like easing your hand out of a wet rubber glove. The body section starts to



rise as the crayfish takes in water, swelling the tissues and expanding the new skin underneath. At the same time it is loosening its legs and feelers from their casings. The movable mouth parts have to be freed in the same way.

The head now hinges forward and the fast growing new head is drawn up and back. Even the eyes have to come through the old eye stalks. This is no time for claustrophobia! Now everything happens at once — the tail is drawn clear of the old shell and with a couple of tail flips the shiny new crayfish stands on soft, wobbly legs behind its former self, which is surprisingly still in one piece. Perhaps this is a trick of nature to distract any enemies while the crayfish tucks itself away in a safe corner until its new shell hardens.

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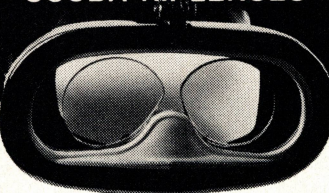
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TECHNIFACTS

(Continued from Page 35)

down due to adverse United Kingdom regulations and tax demands. If a proposed law is enacted (it may be in force by now) all divers working in the British sector would be required to obtain certificates. During 1981 divers would be issued certificates by the dive contractors. Starting in January, 1982 the certificates would be issued only by a certifying board set up by the Health and Safety Executive (roughly equivalent to the U.S.'s OSHA). One of the provisions of this act, if passed, will be that on any dive job, regardless of depth, a minimum of four men would be required (presumably a diver and three support personnel) in each dive team instead of the present three divers and one supervisor as the dive team. This looks fine for divers but it will work adversely just as the OSHA regulations did in that it will force companies to find diver alternative methods of accomplishing underwater tasks.

Technifacts has been able to compile a list of 125 dive companies working in offshore oil on a worldwide basis (as of June, 1981) employing a total of 4985 divers. Of these, ten conglomerate type companies employ about 84 percent, an estimated 4200 divers. (One company, COMEX, employs 1200 divers.) The other 115 companies employ 785 divers, the balance of the total offshore diver population. Technifacts estimates an additional 900 divers work in commercial harbor construction, outfall sewer installation, and in various other fields of marine construction, salvage, and research; mostly in two to four diver companies, for a grand total of 5885 divers employed worldwide on a more or less full time basis. With an estimated average of three support persons for each of the nearly 6000 divers in the water, a total of over 17,000 additional diver related employees, most of them trained to some extent as divers, are on the worldwide dive company payroll, making a total of about 23,000 diver and diver-related employees.

Note: The above is the best available information. One Technifacts reader suggested there are nearly 500 companies worldwide employing divers. This is probably correct, or nearly so, when considering that the 900 or so divers in commercial diving other than oil field diving are working in one, two or three diver companies. However, I feel there are no more than about 150 companies employing divers on a full time basis in offshore oil.

As indicated above, most support personnel in the dive industry must be diver trained because they are tenders, mixed

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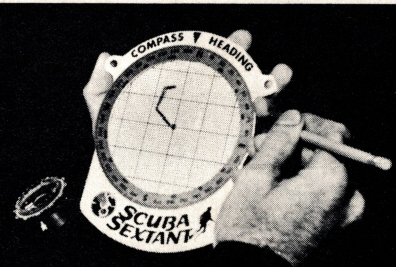
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gas rack operators, chamber operators, medical technicians, etc. In connection with the inspection and maintenance of offshore structures, as pointed out by Cushman last month, most oil companies, and some governments, are now insisting that diver-inspectors be formally trained and qualified in NDT work. Technifacts has pointed out many times that the best way to become qualified in the many aspects of the offshore dive industry is via a commercial diving school.

At present there are about 20 known diver training organizations in the world. Twelve of these are in the United States, eight in other countries including Scotland, Italy, Norway, Canada and Russia. Some of the dive schools are owned by large offshore contracting companies and are able to employ from 50 to 95 percent of their graduates in-house, as it were. If a prospective diver hopes to become employed in the offshore oil industry he should carefully select a school that provides training for this type work.

Income from such diving is good although not phenomenal, perhaps averaging less than \$50,000 annually. I have stated previously that there are a few divers who earn at least \$100,000 annually and have gotten arguments from divers about that statement. I must add that all divers I know in this category are specialists who not only are of great value as divers but also serve as company representatives in inspection, planning, performing and supervising highly technical underwater work for organizations that have other dive companies performing the actual contract work.

Some Technifacts readers' comments pertinent to this month's subject follow:

"I think all dive schools forget the diver who sits, fully employed, waiting many boring hours aboard a rig, where rigs sometimes work for months without a diver getting wet. Or where it is the other way around and the diver works every day for four solid months without a day off."

Note: A recently published report stated that COMEX has two dive vessels working for Mexico with 60 divers on board each vessel and with 9 to 12 divers under saturation at all times on a contract that lasts through 1983. That is a lot of diving, and a lot of dive support personnel working full time for a long time.

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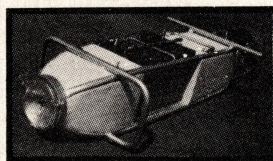
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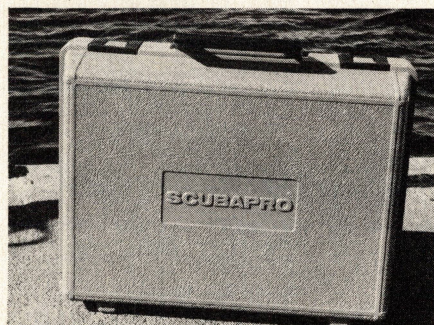
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It is probably apparent to Technifacts readers that any discussion of the offshore oil industry, and the job possibilities for divers, is easy as long as the future doesn't get involved. However, some things are for sure. Offshore oil industry expenditure for 1980 was about \$20 billion. Estimates recently published predict that the expenditure will increase by about \$4 billion annually for the next five years, reaching \$40 billion annually by 1985. At present all operable offshore drilling rigs, plus about 75 under construction, are under contract, some for long term jobs.

An analysis of all available information indicates it is likely the upward trend in offshore work, and work for oil field divers, will last at least through 1985. New development schemes and deregulated oil prices may make presently marginal oil fields economically viable producers. If this happens, and if all drilling and development systems presently under construction and planned are put in operation, all diving in support of the offshore oil industry will continue to grow for the next ten years. After that the need for oil, and the amount of oil available, will depend on many factors such as development of alternate energy, cost of getting at remaining oil, stability of governments throughout the world, and, probably to a great extent, as far as work for divers is concerned, technological developments that will radically influence the need for divers in the development and production of offshore oil fields.

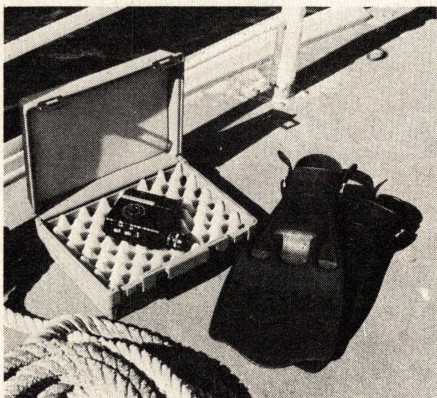
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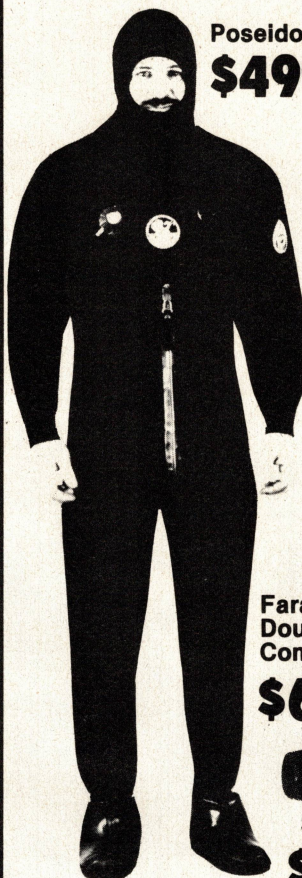
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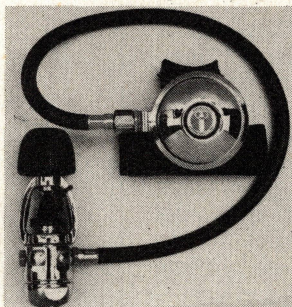
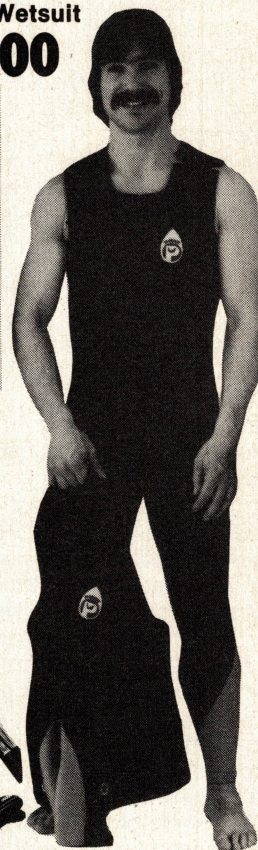


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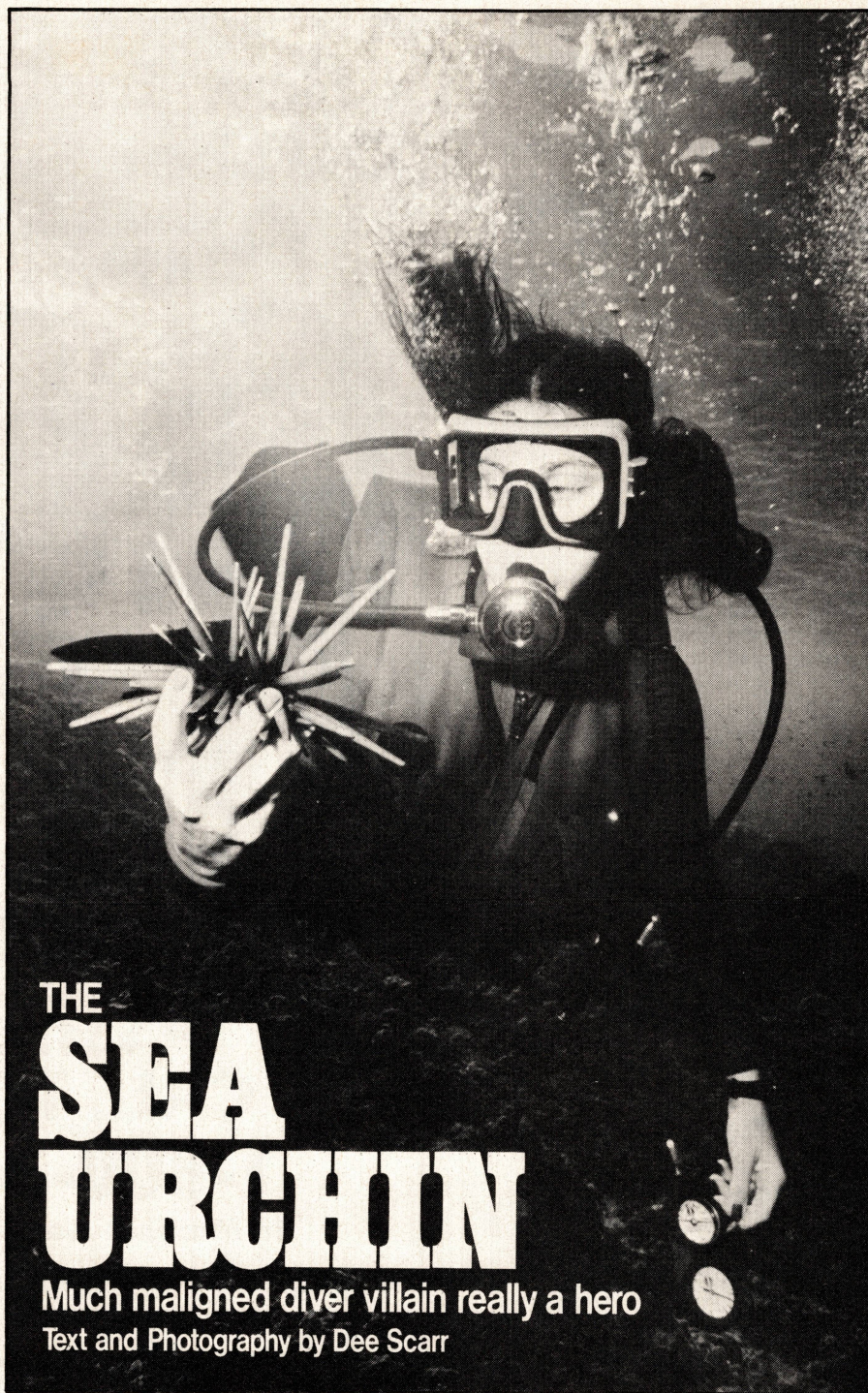
Would you dive with animals your scuba text described as, "noxious," "troublesome," "dangerous?" Should a diver leave the water when these terrible creatures are sighted? Hardly. The animal so described in many textbooks is none other than the ever-present "living pincushion" (also quoted from a scuba text), the sea urchin.

Urchins may well be the most maligned creatures in the sea. First of all, the Caribbean long-spined, black sea urchin — usually called the *Diadema*, for its scientific name is *Diadema antillarum* (crown of the Antilles) — is the individual about which most of these bad reports center. And although it is true that bumping into one of these critters isn't very pleasant, neither is bumping into sharp elkhorn coral or a cactus plant, but volumes aren't written about staying away from them! People even cultivate cactus in their homes and gardens — maybe the *Diadema's* reputation will change when people begin living in permanent underwater habitats . . .

Now that *Diadema* has been redeemed (poor troublesome thing), we can look at its good side. Have you ever heard of birds nesting on cactus plants? The protective value of the plant is obvious — and urchins are used in the same way by arrowcrabs, larval fish and shrimp. What predator can reach an animal protected by sharp spines up to 16 inches long? Watch a trumpetfish approach a school of larval shrimp near a *Diadema*. The trumpetfish comes closer. The tiny shrimp take up their places within the sphere of the urchin's spines. The trumpetfish glides nearer to the spines. The shrimp retreat closer to the urchin's test. And then, if the shrimp have been fast enough, the fish swims away, defeated. Trumpetfish just don't seem willing to risk their well-adapted bodies to those dangerous spines. Of course, from the shrimp's point of view, a more accurate term than dangerous would be protective. The spines offer the urchin protection from predators that consider it a tasty morsel.

While we're on the subject of food, what do urchins eat, anyway? Their main food is algae. Have you ever seen a dead, algae-covered reef? There may well have been very few urchins around it. Some biologists believe that the urchins eat the algae which would otherwise be destructive to the living coral. So when scuba divers helpfully chop up urchins for the fish to eat — they may be assisting in the destruction of the coral on that reef.

There are other reasons for not murdering urchins. For one, they can be very photogenic. Many are brightly colored and even the black or black-and-white *Diadema* with all its long spines, makes an eye-catching photograph.

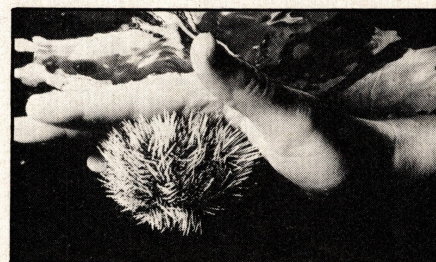


THE SEA URCHIN

Much maligned diver villain really a hero

Text and Photography by Dee Scarr

Urchins and their relatives can be fun to hold, too. Some short-spined urchins have lots of tiny tube feet in between their spines. Place one of these animals on your hand and let it rest there for a minute or so, then turn your hand over. Abra-cadabra! You're a magician, defeating gravity, for your hand is upside down but the urchin isn't falling. Actually, of course, the animal's tube feet are clinging to your hand in the same way they cling to the underside of rocks or the sides of pilings. If you rest the urchin upside down, it will use its tube feet to turn itself over, and when it's foraging,



Sea urchins can be handled if this is done carefully. Here the animal clings upside down by means of its tube feet. The hand is just under the water surface.

the tube feet help camouflage the urchin by holding bits of turtle grass, shells, rocks and other debris.

Closely related to *Diadema* and equally fascinating in behavior are the heart urchins and sea biscuits. In areas of coarse sand, the heart urchins can be found at the end trails, about three to five inches below the surface of the sand. Reaching down into apparently barren sand and coming up with one of these animals is another trick that is sure to im-



Heart urchins such as this can be found burrowing under a few inches of sand.

press your dive buddies, but there is more to the trick than this. If you examine the animal closely, you are likely to find a tiny, three-fourth inch white crab living in between the closely-growing spines on the urchin's underside. The crab is provided with free transportation — and protection — by its spiny friend, and is thus able to concentrate more of its energies on finding food.

Generally, marine scientists acquire their specimens by netting or dredging and although some of them are able to spend time studying animals in their natural habitats, sport scuba divers have an equal opportunity to observe the behavior of marine animals. The urchin — villain of the scuba textbooks — is a perfect animal to begin such study with: It provides protection and adds beauty to the reef, and shows interesting behavior to the alert scuba diver. Maybe we should call it Our Hero, the Urchin! 🐼

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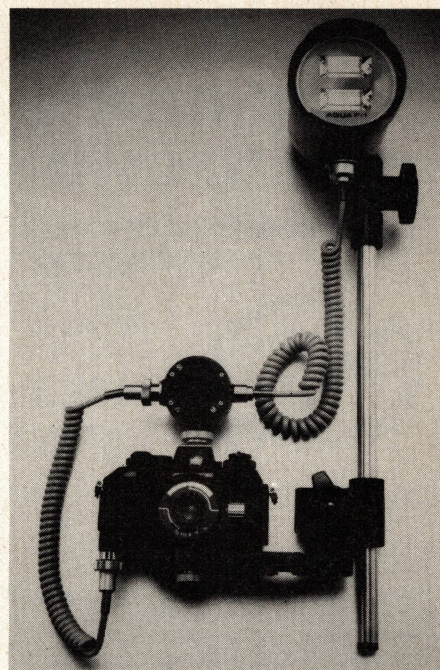
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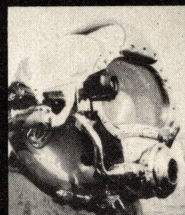
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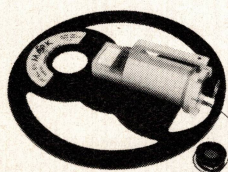
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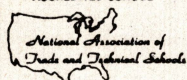
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Further information may be obtained from Video Presentations Inc., 1929 Third Ave., Seattle, WA 98101.

DIVER OF THE YEAR

The Scuba Sport Rites Club of Rye, New York selected R. Robert Abrams and John C. Fine as the Diver of the Year



at the annual Dive to Adventure Symposium and Film Festival at the State University of New York — Purchase.

"It was a snorkel-to-snorkel race to the final selection for the award," said Armand Zigahn, president of the club, so Walter (Butch) Hendrick, an advisor to the club and to-be presenter of the award, recommended that both John and Bob be given the award.

"Bob Abrams produces motion pictures made by Jack McKenney and yet finds time to be an advisor to our club and lends unfailing support to other area clubs," said Hendrick.

"John Fine is a certified instructor by all U.S. agencies, as is Bob. In addition, he is an active delegate to CMAS, the international diving agency."

For more information contact: Armand Zigahn, President, Scuba Sport Rites Club, P.O. Box 644, Rye, NY 10580.

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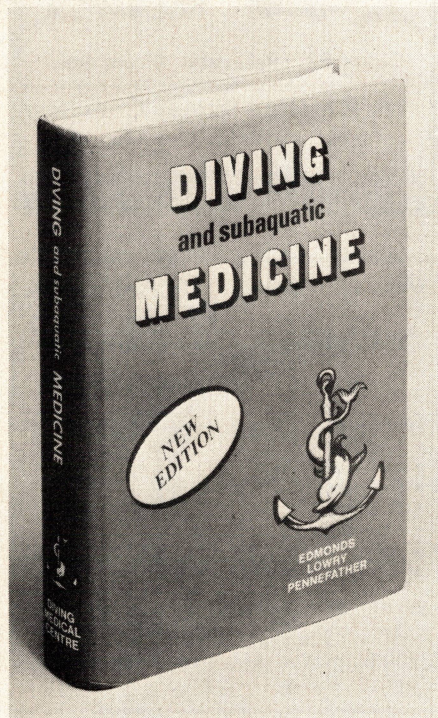
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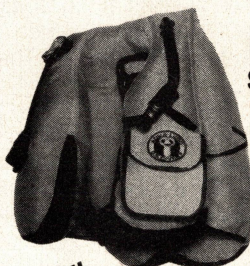
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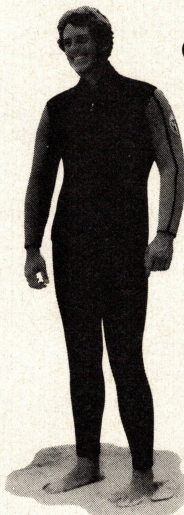
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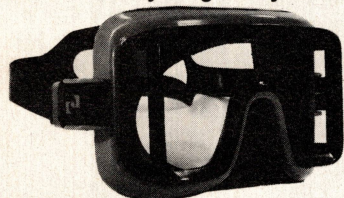
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AL MIKALOW

(Continued from Page 48)

her. Ironically, she may be in no more than 40 or 50 feet of water as approximately 80 percent of the bay is relatively shallow. In many areas there is as little as 18 to 20 feet of water, with deep ravines forming the shipping lanes.

Al Mikalow has pursued the *Rio* constantly in between classes at the Coastal School of Deep Sea Diving which he owns and operates in Oakland. "There was one time back in the 1950's," he says, "when I thought I'd found the *Rio*, but it didn't pan out." He even went so far as to spend a small fortune building special dive gear which could withstand the extreme pressures encountered at unusual depths, but all in vain. He hasn't found the *Rio* but he's still looking. Now he's focused his attention in the vicinity of Angel Island, an area, he speculates, where the *Rio* may have drifted.

The *Rio* is not the only treasure bearing ship resting in Davy Jones' Locker. On the soupy morning of December 11, 1952, a Norwegian motorship, the *Fernstream*, went down in 200 feet of water about a mile off the Presidio Shoals. As far as anyone knows she is still unmolested.

In February of 1913 two sternwheelers, the *H. J. Corcoran* and the *Seminole*, collided near Angel Island capsizing the *Corcoran* and severely damaging the *Seminole*, a gambling boat. The *Seminole* was towed away to the Alameda mud flats where she rotted away. The *Corcoran* was turned back over only to discover that her boilers and vault had ripped away from the deck and sunk into the gloomy depths. She had been loaded with tons of sugar, lead ingots and \$300,000 in gold bars. It is all still down there.

Marine archives list numerous other vessels which have gone down in San Francisco Bay. Among these unfortunately are the British ship, *Oliver Cutts*, which went down near Little Alcatraz Island in 1868; the *Samoset*, sunk in 1855; the *Aberdeen*, lost in 1852; and the *Golden Fleece*, sunk in 1858.

Many ships reportedly foundering in the bay have simply disappeared never to be seen or heard from again. The bay is dotted with the remains of military aircraft which have gone down over the years, some reportedly in water barely deep enough to cover their fuselages.

Al Mikalow doesn't keep it a secret that he owns the salvage rights on some of the bay's wrecks. "Now just to find the time," he says with a far-off look in his eyes. Whatever else the San Francisco Bay offers to the treasure hunter it also offers a virgin territory unlimited in the possibilities of wealth, excitement and adventure. 

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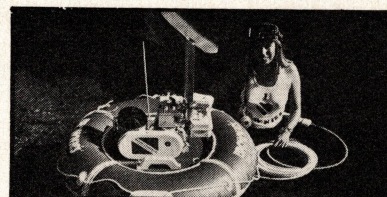
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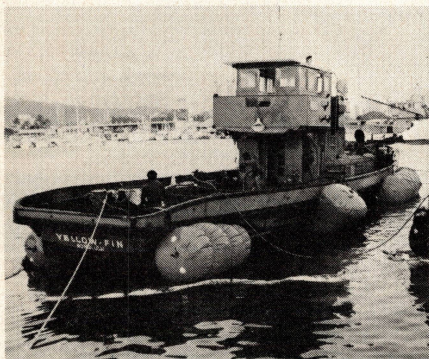
CEN CAL DIVERS DAY

The Central California Council Diving Clubs and Marine World — Africa U.S.A. will present the Fourth Annual Divers Day at Marine World October 4. The program includes equipment displays, safety demonstrations, wacky water races, and much more. The price of the ticket includes admission to all of Marine World's shows and exhibits, Divers Day events, private picnic area, and a chance to win assorted dive equipment in a giant raffle.

Tickets must be purchased in advance and can be found at local dive shops and by writing Cen Cal at P.O. Box 779, Daly City, CA 94017. Prices will be \$7 for adults (regular \$8.95) and \$5 for children (regular \$5.95).

LIFT BAG SALVAGE

A combination of two, three and five ton J. W. Automarine lift bags were used by Pacific Diving Industries, Inc. of Honolulu, Hawaii, in the recent salvage of a 33.3 ton Sampan-type fishing vessel. The ship sank at her berth in Kewalo Basin, in



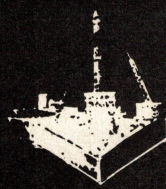
20 feet of water, as the result of an explosion caused by a gas leak.

A three-day salvage operation was led by Ray Tougas, Pacific Diving's general manager.

Automarine lift bags are manufactured in lift capacities ranging from 75 pounds to ten tons, and are made in both parachute and pontoon configurations. For further information about the Automarine line, please contact Jim Mann, Old Road Lane, Mt. Kisco, NY 10549 or Walt Mazzone, 5156 Pacifica Blvd., San Diego, CA 92109.

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The Pennington Rubber Co., 4676 Paddock Rd., Cincinnati, Ohio, has sold its Scuba Diving Division to Aquarius Dive Shop, 800 Elm St., Ludlow, Kentucky. Aquarius, located just across the river and less than ten minutes from downtown Cincinnati, is a full service dive shop and registered air station featuring dive instruction from basic scuba through advanced open water to commercial diving, as well as equipment sales. Headed by Leesa Wiesner, greater Cincinnati's only certified master diving instructor, Aquarius is celebrating its seventh year at the Ludlow location.



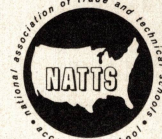
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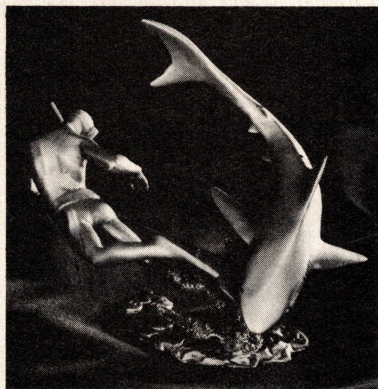
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NIKON CONTEST

Professional and amateur photographers can win a trip to Japan as well as other valuable prizes of Nikon cameras and accessories in this year's Nikon Photo Contest International '81/'82, the largest competition of its kind in the world.

Each entrant may submit a maximum of five photographs for each of the contest's two categories — Category A (Black and White) and Category B (Color). Only photographs taken with a 35 mm camera (any 35 mm camera) can be submitted. Entry forms and rules may be obtained from camera dealers nationally, or by writing NPCI, Nikon Inc., P.O. Box 307, Garden City, NY 11530. All entries must be submitted no later than October 31.

A total of 163 prizes will be awarded. The Grand Prize — the overall winner in the color and black and white category — will be awarded an engraved gold medal and either a roundtrip ticket to Tokyo, or a selection of Nikon products. If the winner chooses the trip, he/she will also get hotel accommodations for five nights, a tour of the Nikon head office and a selected Nikon factory.

The First Prize in each category is a Nikon F3 camera with Motor Drive (MD-4), Speedlight (SB-12), choice of two Nikkor lenses (as specified in the entry form), and an engraved gold medal. Second Prize, to the next ten winners in each category, is a Nikon FE camera, choice of one Nikkor lens (as specified in the entry form), and an engraved silver medal. A Nikon FM camera and an engraved bronze medal will be awarded to each of the next 20 winners in each category. Fifty Honorable Mention winners will receive a special gift and an engraved bronze medal.

All of the winning photographs will be published in the beautiful Nikon Photo Contest International 1981/82 Yearbook. One copy of this book will be sent to each of the winners. Additional copies may be purchased at \$6 per copy. Winning photographs will also be displayed in 1982 at a special NPCI show at Nikon House in New York City.

PADI WINNERS

Russell Walker of Fordyce, Arkansas is the winner of PADI's Turn A Friend On To Diving Sweepstakes. Walker won a deluxe one week dive vacation in Cozumel at the Hotel Barracuda. He entered the contest through Lynn's Ski 'N Scuba in Little Rock, Arkansas. Earl Dunning of Mountain View, Hawaii, won second prize, a \$250 gift certificate to be used at Nautilus Dive Center, Hilo, Hawaii. Over 270 prizes were awarded to sweepstakes entries from over 200 stores around the world.

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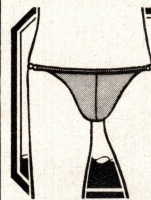
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The commission is listed by the U.S.
Office of Education as the official ac-
crediting agency for the country's private
trade and technical schools.

To satisfactorily fulfill the Commis-
sion's standards of educational, ethical
and business practices, Divers Training
Academy, Inc. underwent detailed study
and was visited by an examining team
of qualified professionals and special-
ists. Among the factors considered were
the school's history and integrity of oper-
ation, its course offerings, faculty, ad-
mission rules, enrollment and business
policies.

BERRY SCUBA PROMOTION

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For information contact: Bauer Breath-
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Tahiti in the Society Islands, then contin-
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The new Tahiti service departs Los An-
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The same flight, QF #12, departs
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7:20 am, then goes on to Melbourne, ar-
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For more information contact: Ernest
Beyl, Qantas Public Relations Officer,
177 Post Street, Penthouse, San Francis-
co, CA 94108; telephone (415) 391-0378
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_____ Wrist
_____ Forearm
_____ Elbow
_____ Biceps
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_____ Ankle to Crotch
_____ Ankle to Waist
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A ☐ 1-3 B ☐ 4-8 C ☐ 9-12 D ☐ 13-18 E ☐ None

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QUESTIONNAIRE

Please help us by answering the following questions:

1. How many overseas diving trips do you make per year?

A ☐ One B ☐ Two C ☐ Three D ☐ Four-Six

2. Which is the most important consideration in selecting a dive trip destination?

1 ☐ Hotel 2 ☐ Dive Services 3 ☐ U/W Visibility 4 ☐ Marine Life

3. After you complete an enjoyable dive trip, how many other people do you recommend the same trip to?

A ☐ 1-3 B ☐ 4-8 C ☐ 9-12 D ☐ 13-18 E ☐ None

4. How do you usually pay for your overseas dive trips?

1 ☐ Cash 4 ☐ Mastercard/charge 7 ☐ Other

2 ☐ Travelers cheques 5 ☐ Visa

3 ☐ Air Travel Card 6 ☐ American Express

5. What area(s) do you plan to visit on a future dive vacation?

A ☐ Red Sea C ☐ Bahamas E ☐ Indian Ocean

B ☐ Caribbean D ☐ Pacific F ☐ Australia

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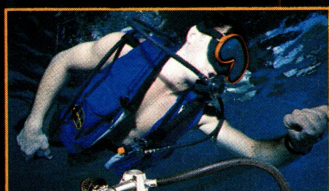
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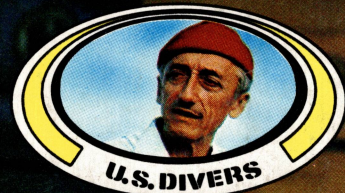


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